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APPENDICES
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Regional Educational Laboratory Northeast
At Education Development Center

Accelerated college credit programs and their relationship to educational attainment in Rhode Island

See https://ies.ed.gov/ncee/edlabs/projects/project.asp?projectID=5680 for the full report.

Appendix A. About the study

Many states have adopted accelerated college credit programs that allow high school students to simultaneously earn credit toward a high school diploma and toward a postsecondary degree as a strategy to improve students' college readiness and college success. All but three states have a statewide policy promoting accelerated college credit programs (Zinth, 2016a). Further, 27 states, including Rhode Island, made dual enrollment or college credits part of the "fifth indicator" in their Every Student Succeeds Act plans (Jordan & Marley, 2018). Whereas some programs allow high school students to take regular college classes taught by faculty on a college campus and earn credits toward both their high school and their college degrees (referred to as *dual enrollment* in this study), others offer college credit-bearing courses taught by a high school instructor on-site at a high school (referred to here as *concurrent enrollment*). Other high school-based programs, such as Advanced Placement (AP) and International Baccalaureate courses, allow students to earn college credits through a standardized curriculum by scoring well on an assessment that is recognized by many colleges in lieu of credits. Some schools offer college credit as part of a comprehensive program, such as the *early college* model, through which high schools and postsecondary institutions partner to provide historically underrepresented students with an integrated course sequence and comprehensive academic and socioemotional support to make substantial progress toward a college credential during high school (Zinth, 2016b). International Baccalaureate and early college programs are not widely offered in Rhode Island—no public schools offer International Baccalaureate courses, and annually there are approximately 100 students enrolled in early college programs based on the P-TECH model that aims for students to complete a two-year college degree during high school.

Educational outcomes of accelerated college credit programs

Rigorous quasi-experimental design studies have found positive impacts of accelerated college credit programs on college enrollment, persistence, and degree completion (An, 2013; Giani et al., 2014; Struhl & Vargas, 2012).[5] Experimental design studies of the *early college model* have linked participation to increased rates of high school graduation, college enrollment, and college completion (Edmunds et al., 2017; Haxton et al., 2016). A randomized

[5] These three quasi-experimental studies each used a propensity score–based approach similar to the one employed in the current study, with some differences in specification. For example, An (2013) used propensity score weights rather than matching; Struhl and Vargas (2012) selected one-to-one matched comparison students only from districts offering the accelerated college credit treatment; and Giani et al. (2014) drew one-to-one matched comparison students from districts *not* offering accelerated college credit options.

controlled trial of a *concurrent enrollment* mathematics course had mixed effects, demonstrating a positive impact on subsequent rigorous mathematics course-taking during high school and on enrolling in a four-year rather than two-year college but showing no significant effect on college enrollment in general or on college mathematics performance (Hemelt, Schwartz, & Dynarski, 2019). Evidence from a correlational study also suggests a positive association between engaging in accelerated college credit programs and avoiding development education course enrollment in college (Davis, Smither, Zhu, & Stephan, 2017).

Few large-scale studies have assessed the comparative value of different accelerated college credit models. Many studies on the topic do not distinguish between courses taught at high schools and at colleges, or between courses taught by high school or by college instructors. The location of course offerings is important because high school and college-based programs offer distinct advantages and disadvantages, such as different required qualifications for instructors, opportunities for students to develop familiarity with the college setting, and transportation and geographic barriers (Piontek, Kannapel, Flory, & Stewart, 2016; Zinth & Barnett, 2018). Two quasi-experimental design analyses comparing college credit-bearing courses of unspecified type to AP courses found divergent results, with An (2013) identifying no difference in college degree attainment in a nationally representative sample but Giani et al. (2014) estimating a larger effect on postsecondary outcomes associated with college credit-bearing courses than with AP course-taking among Texas students. However, few studies—and no rigorous impact studies—were identified that compared the effects of dual and concurrent enrollment models. One statewide correlational study found that concurrent enrollment courses had larger positive effects on postsecondary enrollment than AP courses, whereas dual enrollment courses had no effect (Speroni, 2011). A second correlational study examining dual, concurrent, and AP participation suggested a possible positive association between each of the programs and faster bachelor's degree completion (Burns, Ellegood, Bernard Bracy, Duncan, & Sweeney, 2019).

Without careful thought about eligibility requirements and program characteristics, the benefits of accelerated college credit programs may apply only to academically advanced students who would have attended college anyway (Zinth & Barnett, 2018). In many states, accelerated college credit programs serve a student population that is disproportionately White, female, academically high achieving, and not economically disadvantaged (Davis et al., 2017; Estacion, Cotner, D'Souza, Smith, & Borman, 2011; Lochmiller, Sugimoto, Muller, Mosier, & Williamson, 2016; Pierson, Hodara, & Luke, 2017). If students are not adequately prepared for challenging college-level courses, accelerated college credit programs may even have negative effects on students' educational outcomes (Miller et al., 2018).

Using a quasi-experimental design and a statewide sample, this study contributes rigorous evidence concerning the effects of accelerated college credit courses on students' educational attainment in high school and college. In addition, the study adds exploratory findings to the limited evidence base on differences in educational outcomes associated with dual course enrollment, concurrent course enrollment, and AP test-taking. It also examines the relationship of these programs to college readiness as measured by developmental education course enrollment.

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Appendix B. Methods

This appendix describes the data and analysis methods used in the study.

Data

Data for this study drew from administrative data sources for a statewide longitudinal sample of Rhode Island public high school students.

Sample

The study focuses on a cohort of students who were first-time ninth graders in 2013/14. The Rhode Island Department of Education (RIDE) began collecting detailed, reliable student-level data on dual and concurrent enrollments in 2015/16. The 2013/14 grade 9 cohort was the first for which the state agency had two years of these data. The study focused on this cohort because at the time, it was the only cohort for which the state had complete data on dual and concurrent enrollment for both the 2015/16 and 2016/17 school years (their on-time junior and senior years) as well as data on postsecondary outcomes from the state longitudinal data system through fall 2019. Two additional cohorts (the grade 9 cohorts of 2014/15 and 2015/16) were analyzed as a supplemental component of the study, as described in appendix D.

The sample included all public school students who met the cohort definition, with the exceptions described here. Students were included if they attended a public charter school, specialty school, or vocational–technical school; if they dropped out or left the state's public schools after grade 9; and if they were not continuously enrolled in the years after grade 9. Students were excluded from the sample if they were enrolled in grade 9 in 2013/14 but were repeating the grade the next year; if their grade 9 enrollment record was less than 30 days long; or if their grade 9 enrollment was not associated with a specific high school, as is sometimes the case with students receiving outplacements for special services. Because the study used a quasi-experimental approach that matched students on their characteristics before they started high school, the sample was also limited to students who had an enrollment record for grade 8 in the previous year (2012/13) and a valid standardized state assessment score (values greater than or equal to 800) for that year. These exclusions reduced the sample from 9,915 students enrolled in grade 9 for the first time in 2013/14 to 8,726 students in 62 schools. The excluded students were more likely to be racial/ethnic minority, economically disadvantaged, and multilingual learners, in part reflecting the differences in characteristics of students from immigrant families who enter the Rhode Island public schools after grade 8 or whose families move more frequently.

Variables

All measures were provided by DataHUB, the state's longitudinal data system, which houses and links data elements from a wide range of state agencies and other sources. For this study, the sources (as indicated in table B1) were RIDE, the Rhode Island Office of the Postsecondary Commissioner (RIOPC), and the National Student Clearinghouse (NSC).

Table B1. Measures used in the study

Measure	How used in study		Source of data
Enrollment in dual enrollment course in grades 11–12[a]	Treatment		RIDE
Enrollment in concurrent enrollment course in grades 11–12[a]	Treatment		RIDE
Took an Advanced Placement test in grades 9–12	Treatment		RIDE
High school diploma received	Outcome: High school completion		RIDE
Enrollment in any postsecondary institution within 12 months of high school graduation date	Outcome: College enrollment		NSC and RIOPC
Developmental education course enrollment record (any subject) at a Rhode Island public college within one year of high school graduation	Outcome: College readiness		RIOPC
	Covariate for:		
	propensity score estimation	treatment effect estimation	
Student			
Eligible for National School Lunch Program (an indicator of economic disadvantage)	Yes	Yes (moderator)	RIDE
Scaled math score for New England Common Assessment Program, grade 8	Yes	Yes	RIDE
Racial/ethnic minority (yes/no)	Yes	Yes	RIDE
Sex (male, female)	Yes		RIDE
Multilingual learner, grade 8	Yes		RIDE
Has an Individualized Education Program, grade 8	Yes		RIDE
Chronically absent (>= 10 percent of days), grade 8	Yes		RIDE
Suspended one or more times, grade 8	Yes		RIDE
School			
School of student's first grade 9 enrollment record (Level-2 cluster membership indicator)	Yes	Yes	
Total enrollment	Yes		RIDE
Driving distance to nearest Rhode Island public college campus	Yes		RIDE
Locale (urban, suburban, or rural)	Yes		RIDE
Percent students eligible for National School Lunch Program		Yes	RIDE
Percent students who are multilingual learners		Yes	RIDE
Percent students who have an individualized education program		Yes	RIDE

NSC is National Student Clearinghouse. RIDE is Rhode Island Department of Education. RIOPC is Rhode Island Office of the Postsecondary Commissioner. School-level measures reflect 2013/14 values.

Note: [a] Dual and concurrent enrollment data were available for grades 11–12 for the 2013/14 grade 9 cohort featured in the body of the report, grades 10–12 for the 2014/15 grade 9 cohort, and grades 9–12 for the 2015/16 grade 9 cohort (see appendix D for the latter cohort analyses).

Treatment status—participation in an accelerated college credit program—was defined as having one or more enrollment records for dual or concurrent enrollment courses in grades 11–12, and a record of taking one or more AP tests in grades 9–12. This approach has the following limitations:

- Because reliable student-level data on dual and concurrent enrollment were available starting in 2015/16, participation in accelerated college credit programs was captured only for grades 11 and 12. Based on a later cohort (2015/16 grade 9 cohort) that has these data spanning the full four years of high school, an estimated 2 percent of students take dual and concurrent enrollment courses in grades 9 or 10 but not in later grades, meaning that they would be incorrectly classified as not participating in such courses in this study.

- Dual enrollment records are available only from the state's public colleges. Rhode Island also funds dual enrollment at private colleges in the state but does not collect student-level enrollment information from these institutions. Aggregate figures provided by RIDE indicate that approximately 1,000 high school students per year take courses at the three participating private colleges in the state. If these students did not enroll in additional courses at Rhode Island public colleges, they would be misidentified as nonparticipants in this study, potentially attenuating the estimated effects of the program.
- RIDE does not collect data on AP course enrollment—only on tests taken. If students enrolled in an AP course but did not take the test, they would be misidentified as not participating in this type of accelerated college credit program.
- RIDE does not identify the approximately 100 students per year who enroll in early college programs in the state. Although these students' participation in dual or concurrent enrollment is captured at the course level, the effects of this more comprehensive model for accelerated college credit cannot be differentiated.

College outcome measures were drawn from a combination of national and state sources.

- NSC collects enrollment and degree completion data on approximately 98 percent of the nation's students at public and private postsecondary institutions, including less-than-two-year institutions (National Student Clearinghouse, 2020). If an enrollment record was not found in NSC or in the Rhode Island public college enrollment dataset, the research team coded the student as not college enrolled. However, students may be missing from NSC records incorrectly because the student or institution opts out of data reporting or because of errors in matching records.
- RIOPC collects data from the state's three public colleges: the Community College of Rhode Island and two four-year institutions, the University of Rhode Island, and Rhode Island College. In some cases, a student had an enrollment record reported by RIOPC but no record from NSC. These students were counted as enrolled in college in the year of the RIOPC record. If a student's only enrollment records were dated before the student's high school graduation date (suggesting dual or concurrent enrollment), the student was coded as not college enrolled.
- Developmental education course enrollment data are available from RIOPC but not from NSC. Inferences drawn from the analyses of developmental education course enrollment are valid only for students who enrolled in a Rhode Island public college. At the time of the analysis, such enrollments were available only for the student's first year after graduating from high school, meaning that students who placed into developmental education but delayed enrolling would be misclassified as college ready.

Missing data

After applying other exclusions discussed above, 3 percent of students were missing a valid New England Common Assessment Program (NECAP) score for grade 8. No other data were missing. Given the low level of missingness, students with missing NECAP values were excluded from analysis.

Descriptive analysis of program participation rates

Participation rates were calculated for participation in any accelerated college credit program as well as for each of the three programs individually, and were disaggregated by student and school characteristics. These descriptive analyses were performed on the unmatched sample. Results indicated that 41 percent of students participated in one or more accelerated college credit programs, with differences in participation rates by program and by student characteristics (tables C1 through C6 and C9).

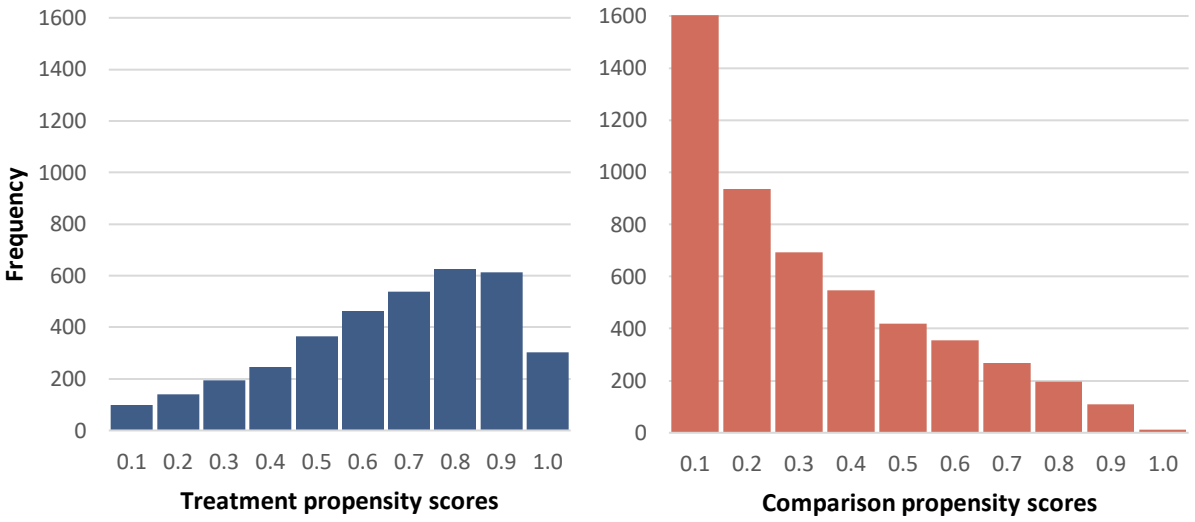
Propensity score matching analysis

This study used observational data; students in the study sample chose whether to participate in the accelerated college credit programs and were not randomly assigned to participate. Because students self-selected into the programs, observed differences in outcomes for those who chose to enroll and those who did not could be due to initial differences between these groups that led them to select into or out of the programs, rather than to the programs themselves. To reduce this potential selection bias, the research team used a propensity score matching approach to construct a comparison group of students who were statistically similar to the treatment students before starting high school (Rosenbaum & Rubin, 1985).

First, researchers estimated the probability that each student would participate in accelerated college credit programs. This propensity score was derived from a two-level logistic regression model with a random effect for school. The models estimated the student's observed treatment status as a function of a set of variables for student characteristics measured before the student entered high school and characteristics of the first high school the student attended (see table B1). A two-level model was chosen in part because school factors constrained the student's decision to participate in the programs. In particular, eight schools did not offer concurrent enrollment. The predictors selected were correlated with treatment status and with the outcome measures of interest (Austin, 2011). Once the propensity models were estimated, the propensity score was calculated as a predicted probability of treatment, using both fixed effects in the model as well as the school random effect from the empirical Bayes means. Although the distributions of the resulting propensity scores for treatment and comparison students overlapped between the values of 0.01 and 0.95, which is the area of common support, the ratio of treatment to comparison students was very high at the upper end of the distribution with propensity scores above 0.60, and very low at the opposite end of the distribution with propensity scores below 0.20. Among treatment students, 52 had propensity scores higher than the area of common support (see figure B1).

Figure B1. Distribution of propensity scores for treatment and comparison students; 2013/14 grade 9 cohort

Frequency of propensity scores



Note: The sample size is 8,726 students who were first-time ninth graders in Rhode Island public schools in 2013/14. See table C2 in appendix C for more information.
Source: Authors' analysis of data from Rhode Island Department of Education.

Students who participated in accelerated college credit programs were then matched with students who did not based on the closeness of their propensity scores. The resulting sample was a group of students who enrolled in an accelerated college credit program—the treatment group—and a group of students with similar predicted

probabilities of enrolling, but who did not enroll—the comparison group. Comparisons of outcomes for these two groups provide an estimate of the average treatment effect on the treated (ATT). ATT represents the difference between what actually happened to students in the accelerated programs when they participated and what would have happened had they not participated.

The research team tried several different matching specifications (Guo & Fraser, 2010), including many-to-one matching, whereby multiple comparison students are matched to a treatment student; matching with replacement, in which comparison students can be matched to more than one treatment student; and preferential matching, which first looks for an acceptable match within the same school and then searches at other schools if necessary (Arpino & Cannas, 2016). The specification resulting in the best baseline equivalence was a nearest neighbor algorithm specifying one-to-one matching without replacement and limiting matches within a caliper of 0.20 standard deviations of the propensity score, which allowed students to be matched with peers attending different schools (*psmatch2* in Stata version 14). The matching process resulted in a reduced sample of 1,958 treatment and 1,958 comparison students, a total sample of 3,916 students in 57 schools. Among the treatment students, 1,628 (45 percent) were excluded because there were not enough acceptable matches among the comparison students to pair with them. Researchers chose this conservative matching approach because it achieved greater internal validity through the greatest reduction in selection bias; however, this decision reduced external validity, since the higher-scoring treatment students were excluded and inferences about those students could not be made (Austin, 2011). It should be noted that in matching some treatment students with a comparison student outside their school, the analysis did not entirely hold school effects constant between the treatment and comparison groups.

After matching, the resulting treatment and comparison groups were found to be statistically similar on baseline characteristics, with standardized mean differences of less than 0.05 (Rubin, 2001; What Works Clearinghouse, 2020; see table B2).

Table B2. Baseline equivalence before and after matching, 2013/14 grade 9 cohort

	Before matching			After matching		
	Treatment mean (*n* = 3,586)	Comparison mean (*n* = 5,140)	Standardized mean difference	Treatment mean (*n* = 1,958)	Comparison mean (*n* = 1,958)	Standardized mean difference
Student level:						
NECAP (grand mean centered)	5.66	-4.91	1.02	1.25	1.64	-0.04
Has IEP	0.04	0.23	-0.57	0.07	0.07	0.00
Multilingual learner	0.03	0.06	-0.16	0.05	0.04	0.02
National School Lunch Program eligible	0.28	0.50	-0.48	0.38	0.36	0.03
Chronic absence (10+)	0.07	0.23	-0.44	0.12	0.11	0.03
Has 1 or more suspensions	0.03	0.15	-0.43	0.03	0.05	0.01
Male	0.42	0.58	-0.33	0.49	0.47	0.04
Racial/ethnic minority	0.29	0.39	-0.19	0.34	0.34	0.00
School level:						
Number of students enrolled (log value)	6.81	6.81	0.00	6.79	6.80	-0.03
Driving distance to nearest Rhode Island public college campus	6.36	5.84	0.52	6.18	6.18	0.00
Percent students eligible for National School Lunch Program	0.36	0.45	-0.09	0.41	0.40	0.01
Percent students who are multilingual learners	0.03	0.04	-0.01	0.03	0.03	0.00
Percent students who have an IEP	0.13	0.15	-0.02	0.14	0.14	0.00
Locale (suburban)	0.68	0.66	0.02	0.64	0.66	-0.02
Locale (rural)	0.10	0.09	0.01	0.12	0.11	0.01

IEP is individualized education program. NECAP is New England Common Assessment Program.
Source: Authors' analysis of data from Rhode Island Department of Education.

The three accelerated college credit programs were combined for the purpose of identifying matches. Although 55 percent of treatment students overall were matched with a comparison student, the proportion differed across the three programs. Although 55 percent of accelerated college credit program participants were matched overall, the matching rates differed across the three individual programs. Among dual enrollment students, 66 percent were matched; 55 percent of concurrent enrollment students were matched; and 47 percent of AP test-takers were matched.

The baseline characteristics of students in each program before and after matching are displayed in table B3.

Table B3. Baseline characteristics of treatment groups by program, 2013/14 grade 9 cohort

	Means before matching				Means after matching			
	Ever dual enrolled (*n* = 336)	Ever concurrent enrolled (*n* = 2,223)	Ever took Advanced Placement test (*n* = 2,367)	Comparison (*n* = 5,140)	Ever dual enrolled (*n* = 221)	Ever concurrent enrolled (*n* = 1,228	Ever took Advanced Placement test (*n* = 1,104)	Comparison mean (*n* = 1,958)
Student level:								
NECAP (grand mean centered)	0.51	5.93	7.89	-4.91	-2.86	1.58	3.36	1.64
Has IEP	0.08	0.04	0.02	0.23	0.12	0.07	0.04	0.07
Multilingual learner	0.05	0.03	0.02	0.06	0.07	0.05	0.04	0.04
National School Lunch Program eligible	0.56	0.23	0.24	0.50	0.62	0.33	0.35	0.36
Chronic absence (10+)	0.17	0.07	0.05	0.23	0.24	0.12	0.09	0.11
Has 1 or more suspensions	0.09	0.03	0.02	0.15	0.13	0.05	0.04	0.05
Male	0.32	0.43	0.41	0.58	0.32	0.50	0.51	0.47
Racial/ethnic minority	0.53	0.24	0.27	0.39	0.56	0.28	0.33	0.34
School level:								
Number of students enrolled (log value)	6.55	6.82	6.84	6.81	6.58	6.82	6.81	6.80
Driving distance to nearest RI public college	4.09	6.70	6.69	5.84	4.26	6.54	6.53	6.18
Percent students eligible for National School Lunch Program	0.56	0.33	0.35	0.45	0.56	0.37	0.41	0.40
Percent students Multilingual learners	0.03	0.02	0.03	0.04	0.04	0.03	0.04	0.03
Percent students with IEP	0.14	0.14	0.13	0.15	0.14	0.15	0.14	0.14
Locale (suburban)	0.38	0.75	0.69	0.66	0.41	0.70	0.61	0.66
Locale (rural)	0.06	0.12	0.10	0.09	0.05	0.14	0.13	0.11

IEP is individualized education program. NECAP is New England Common Assessment Program.

Note: Students who participated in any accelerated college credit program were matched with students who did not participate in any of the three programs. Some students participated in more than one program.

Source: Authors' analysis of data from Rhode Island Department of Education.

The first research question was addressed using a series of two-level logistic regression models in the matched sample, where the outcome was a binary indicator of attaining the given outcome and treatment was represented by a binary indicator for ever having participated in any of the three accelerated college credit programs.

The main analysis model was:

Student-level model:

$$\text{Log}(P / (1 - P))_{ij} = b_{0j} + b_{1j}(\textit{Any Accelerated Program})_{ij} + b_{cj}(\textit{Student-level covariates})_{ij}$$

School-level model:

Model for intercept

$$b_{0j} = g_{00} + g_{d1}(\textit{School-level covariates})_j + u_{0j}$$

Models for slopes

$$b_{1j} = g_{10}$$

$$b_{cj} = g_{d0}$$

where P is the probability of a student's attaining a given educational outcome, subscripts i and j refer to individual student i in high school j, c is a vector of student-level covariates, u is the school random effect, and d is a vector of school-level covariates. Slopes were fixed.

The decision to use hierarchical generalized linear modeling as opposed to single-level regression with clustered standard errors was based on the ability to obtain more precise estimates, and the flexibility to evaluate the sensitivity of estimates to different model parameters and assumptions. The intraclass correlation coefficient indicated that 9 percent of variation in high school graduation was attributable to between-school differences.[6] District was not included as a third level in the model because districts did not explain substantially more outcome variation than high schools alone.

The model produces results in terms of odds ratios. In this study, the odds ratios represent the change in the odds of a student's attaining a given outcome, such as graduation from high school, in relation to whether the student participated in an accelerated college credit program. A statistically significant odds ratio above 1 indicates that participation is related to increased odds of a student's attaining the outcome compared with the odds for a student who did not participate, and a statistically significant odds ratio below 1 indicates decreased odds of attainment for the participating student.

This report also translates estimated odds ratios into predicted probabilities that use the estimated regression coefficients to produce a point estimate of the probability of attaining the outcome conditional on treatment status. Specifically, the study team calculated two predicted probabilities for each student: one under the assumption that the student was treated and the other under the assumption that the student was untreated. We then averaged the predicted probabilities under each scenario across all students (Pampel, 2020).

Three baseline student and school measures were included as covariates because they were tested for moderating effects: eligibility for National School Lunch Program, the measure used to represent economic disadvantage; grade 8 standardized test score (New England Common Assessment Program [NECAP] mathematics, grand-mean centered); and racial/ethnic minority. In addition, three school-level covariates were included: percentage of students eligible for National School Lunch Program, percentage of multilingual learners, and percentage of students with individualized education programs (IEPs). These variables were included because when the model

[6] The intraclass correlation coefficient was estimated using the Snijders and Bosker (2012) formula for binary outcomes $t_{00}/(t_{00} + \pi^2/3)$ where t_{00} is the estimated between-school variance component in the unconditional two-level model with random intercept for school.

was applied to a second cohort (2014/15 grade 9 cohort) as an additional exploratory analysis, the standardized mean differences after matching were greater than 0.05 for these baseline characteristics as follows: grade 8 NECAP mathematics score (-0.06), percentage of students in the school eligible for national school lunch program (0.06), percentage of students in the school who were multilingual learners (0.08), and percentage of students in the school who had an IEP (0.08). What Works Clearinghouse guidelines (2020) require the inclusion of covariates to reduce the remaining selection bias from such factors.

The regression analyses indicated positive treatment effects of accelerated college credit program participation on high school graduation and college enrollment within one year of high school (tables C7 and C8).

As a sensitivity analysis, different sets of covariates were included in the models: none; NECAP mathematics score only; propensity score only; and all covariates that had been used in propensity score estimation. Additional sensitivity analyses included a fixed effect for schools rather than a random effect, and regression in the unmatched sample. The direction, magnitude, and significance of the treatment coefficient remained very similar in all specifications of the model.

An additional sensitivity analysis was performed to assess whether the findings might be attributable to early drop-out. If students left the Rhode Island public school system before grade 11, they did not have the opportunity to enroll in dual or concurrent enrollment courses that were measured for this study. (Such students could take dual or concurrent enrollment in earlier grades, but data were not available for those years; students could also be counted as treatment participants if they took Advanced Placement (AP) tests in earlier grades.) Researchers excluded the 350 students with no enrollment record in either 2015/16 or 2016/17 (the years of on-time enrollment in grades 11 and 12 for the study cohort), re-estimated propensity scores, performed matching based on the new scores, and then estimated treatment effects using the new matched sample. The direction and the statistical significance of the treatment coefficients remained similar to those estimated from the original sample, although their magnitude was somewhat smaller (table C16).

Moderation effects

To examine the moderating effect of student economic disadvantage, the main model analyzing program effects was expanded to include its interaction with the treatment indicator. The analysis model is shown below.

Student-level model:

$$\text{Log}(P / (1 - P))_{ij} =$$

$$b_{0j} + b_{1j}(\textit{Any Accelerated Program})_{ij} + b_{cj}(\textit{Student-level covariates})_{ij} + b_{2j}(\textit{Econ Dis})_{ij} + b_{3j}(\textit{Any Accelerated Program})_{ij} * (\textit{Econ Dis})_{ij}$$

School-level model:

Model for intercept

$$b_{0j} = g_{00} + g_{d1}(\textit{School-level covariates})_j + u_{0j}$$

Model for slopes b_{1j} to b_{3j}

$$B_{mj} = g_{m0}$$

In the model above, the moderating effect of economic disadvantage is reflected in b_{3j}, the coefficient for the treatment-by-economic-disadvantage interaction. The analyses did not find any evidence for such a moderating effect for the outcomes examined (tables C12 and C13).

The research team also examined the moderating effect of race/ethnicity, defined as "White" or "racial/ethnic minority." The results revealed that racial/ethnic minority status moderated the treatment effect in two out of

the three outcomes considered: College enrollment and enrollment in developmental education courses. Specifically, the benefit of accelerated college credit program participation was larger for racial/ethnic minority students than for White students for college enrollment. Treatment significantly increased the predicted probability of not taking developmental education courses at a Rhode Island public college for both White and racial/ethnic minority students; it decreased the predicted probability of taking developmental education courses at a Rhode Island public college for White students, but did not alter this probability for racial/ethnic minority students. Meanwhile, treatment significantly increased the predicted probability of enrolling in a college other than a Rhode Island public college for both White and racial/ethnic minority students and significantly decreased the predicted probability of not enrolling in any college for both White and racial/ethnic minority students. Racial/ethnic minority status did not moderate the treatment effect on high school graduation (see tables C17 and C18).

Comparison among types of accelerated college credit programs

To estimate the relationship between each specific accelerated college credit program and nonparticipating comparison students, regression analyses were performed on the same matched sample as was used for the overall accelerated college credit program treatment estimation model.

Researchers considered using a more tailored matching approach, for example by matching dual enrollment students with concurrent enrollment students. However, such an approach was deemed impractical because some students participated in more than one of the three programs, and because the student and high school characteristics of dual enrollment students differed substantially from those of concurrent and AP students.

To compare the relative size of effects among the three types of accelerated programs, the main model analyzing program effects was expanded as follows. The treatment indicator in the model was replaced by a series of three indicators: ever enrolled in a dual enrollment course, ever enrolled in a concurrent enrollment course, and ever took an AP test. The model is shown below.

Student-level model:

$$\text{Log}(P / (1 - P))_{ij} = b_{0j} + b_{1j}(\textit{Ever Dual})_{ij} + b_{2j}(\textit{Ever Concurrent})_{ij} + b_{3j}(\textit{Ever AP})_{ij} + b_{c}(\textit{Student-level covariates})_{ij}$$

School-level model:

Model for intercept

$$b_{0j} = g_{00} + g_{d1}(\textit{School-level covariates})_{j} + u_{0j}$$

Model for slopes b_{1j} to b_{cj}

$$B_{mj} = g_{m0}$$

In the model above, the effect of each type of accelerated program is reflected in the coefficient b_{mj} that is associated with the program type. Pairwise post-estimation tests were performed to assess whether the estimated coefficients for each of the three programs were significantly different from each other. Results indicated positive relationships between each program and each outcome (table C15). The post-estimation tests identified a larger effect for Advanced Placement than for dual enrollment on college enrollment.

Several points are noteworthy for this analysis. First, in this cohort in Rhode Island, dual enrollment occurred almost exclusively at the state's two-year public college, whereas concurrent enrollment occurred primarily at the state's four-year public colleges. Thus, the effects of the college are confounded with the effects of the type of accelerated college credit program.

Second, the analysis was performed using a matched sample, which enabled the estimation of the effects of these three types of accelerated programs as a whole. However, whether this analysis is capable of estimating the effect of each program type separately is debatable, because the matched comparison group represents those who did not take any of the accelerated programs rather than those who did not take that particular program type.

Third, the three types of accelerated programs were coded in such a manner that they are not mutually exclusive. For example, a student who takes more than one type of accelerated programs may have "yes" for "ever participated in dual enrollment" and for "ever took an AP test." A consequence of this coding scheme is that the estimated effect of each program type is calculated using course-taking behavior rather than the student as a unit. An alternative coding scheme would be to divide the treatment students into mutually exclusive and exhaustive groups consisting of "only participated in dual enrollment," "only participated in concurrent enrollment," "only took an AP test," and "participated in multiple programs." This alternative coding would estimate the effect of each program type using student as a unit.

A sensitivity analysis was performed using this alternative mutually exclusive coding scheme. These alternative analyses produced results similar to those of the original model in terms of the direction, magnitude, and significance of the estimated effect of each of the three types of accelerated program, with the following exception: participating in more than one program was associated with larger positive effects on each of the outcomes than was participating in any one program alone.

Treatment effect estimation for developmental education course enrollment outcome

The effect of treatment on developmental education course enrollment was assessed using a multinomial regression model. At first glance, developmental course enrollment might appear to be a binary outcome. A student either enrolled in a developmental education course or did not enroll in a developmental education course. If this had been the case, the model analyzing program effects used for other binary outcomes would have sufficed for this analysis as well.

However, as mentioned in the data section, information on developmental education course enrollment was available only for students who enrolled in Rhode Island public colleges. For this reason, the outcome was coded to have four potential values: enrolling in a Rhode Island public college and taking developmental education courses, enrolling in a Rhode Island public college and not taking developmental education courses, enrolling in another type of college, and not enrolling in college. This coding scheme allowed for the use of all students in the propensity score matched analytic sample, preserving the quasi-experimental design capable of estimating treatment effects. Had the analysis been performed using only the subsample of students who enrolled in Rhode Island public colleges, the subsets of treatment and matched comparison students could no longer be assumed to represent statistically equivalent groups. Furthermore, because the treatment affected the probability of enrolling in Rhode Island public colleges in the first place, such an analysis would have produced biased results.

Like logistic models, multinomial models are fit to predict log-odds of the probability of target event. However, unlike logistic models, multinomial models must handle multiple target events. Consequently, in multinomial models, one target event is chosen as the base category. Then a set of equations is fit to predict the log-odds of the probability of each remaining target event over the probability of the base category. The model analyzing program effects used for developmental education course enrollment is shown below. The right-hand side of the model consists of the same set of predictors as in the multilevel logistic model used for the effect estimate for other outcomes, with one exception. Because the statistical software used for this analysis, Stata version 14, did not have a multilevel option for multinomial models, a single-level multinomial model was used with cluster-adjusted standard errors, which are also robust to heteroskedasticity (White, 1980).

Student-level model:

1) $\text{Log}(P\_DevEdRI / P\_NoDevEdRI)_i = b_{0\_DevEdRI} + b_{1\_DevEdRI}(Any\ Accelerated\ Program)_i + b_{c\_DevEdRI}(Student\text{-}level\ covariates)_{ij}$

2) $\text{Log}(P\_NoCollege / P\_NoDevEdRI)_i = b_{0\_NoCollege} + b_{1\_NoCollege}(Any\ Accelerated\ Program)_i + b_{c\_NoCollege}(Student\text{-}level\ covariates)_{ij}$

3) $\text{Log}(P\_OtherCollege / P\_NoDevEdRI)_i = b_{0\_OtherCollege} + b_{1\_OtherCollege}(Any\ Accelerated\ Program)_i + b_{c\_OtherCollege}(Student\text{-}level\ covariates)_{ij}$

where for example *P_DevEdRI / P_NoDevEdRI* is the probability of a student's taking developmental education courses at a Rhode Island public college over the probability of the student's not taking development education courses at a Rhode Island public college.

The nonlinear form of the coefficients in multinomial models, called relative risk ratios (RRR), were converted to predicted probabilities for this report just as the odds ratios were for the logistic models.

One note of caution in interpreting predicted probabilities in the results of multinomial analysis: when the outcome consists of mutually exclusive and exhaustive categories, interpreting the predicted probability for one outcome category in isolation could be misleading. For example, this study found that treatment is associated with a relatively small difference in the predicted probability of developmental education course enrollment (14 percent compared with 17 percent) but also found that treatment is associated with large increases in the predicted probability of enrolling in college in the first place (tables C10 and C11). In short, predicted probabilities from multinomial analyses must be interpreted in the context of the predicted probabilities of all outcome categories.

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Appendix C. Supporting analysis

This appendix contains tables displaying the results of analyses on the 2013/14 grade 9 cohort in more detail.

Table C1. Accelerated college credit program participation, 2013/14 grade 9 cohort

Cohort	All students in cohort	College credit program participation							
		Any college credit program		Any dual enrollment		Any concurrent enrollment		Took any Advanced Placement test	
	N	*N*	Percent	*N*	Percent	*N*	Percent	*N*	Percent
2013/14 grade 9 cohort	8,726	3,586	41.1	336	3.9	2,223	25.5	2,367	27.1

AP is Advanced Placement.
Note: Dual and concurrent enrollment data are only available from 2015/16 and 2016/17, whereas AP test data are available from all four years.
Source: Authors' analysis of data for 2013/14 through 2016/17 from Rhode Island Department of Education.

Table C2. Accelerated college credit program student characteristics, 2013/14 grade 9 cohort

Characteristics in grade 8	All students in cohort		College credit program participation							
			Any college credit program		Any dual enrollment		Any concurrent enrollment		Took any Advanced Placement test	
	N	Percent	N	Percent	N	Percent	N	Percent	N	Percent
Male	4,454	51.0	1,490	41.6	108	32.1	948	42.7	975	41.2
Racial/ethnic minority	3,039	34.8	1,057	29.5	177	52.7	530	23.8	648	27.4
National School Lunch Program eligible	4,144	47.5	1,193	33.3	211	62.8	631	28.4	676	28.6
Has IEP	1,327	15.2	149	4.2	27	8.0	91	4.1	53	2.2
Multilingual learner	423	4.6	105	2.9	18	5.4	65	2.9	54	2.3
Has 1 or more suspensions	908	10.4	115	3.2	30	8.9	60	2.7	50	2.1
Chronic absence (10+)	1,448	16.6	268	7.5	56	16.7	162	7.3	124	5.2
NECAP math:										
Substantially below Proficient	2,045	23.4	289	8.1	69	20.5	167	7.5	106	4.5
Partially Proficient	1,618	18.6	393	11.0	65	19.4	225	10.1	180	7.6
Proficient	3,695	42.3	1,786	49.8	146	43.5	1,119	50.3	1,124	47.5
Proficient with Distinction	1,361	15.6	1,117	31.2	55	16.4	712	32.0	957	40.4

AP is Advanced Placement. IEP is individualized education program. *N* is number of students. NECAP is New England Common Assessment Program.
Note: The sample size is 8,726 students who were first-time ninth graders in 2013/14. The sample size is 8,719 for NECAP math because there are seven cases with NECAP scores but no proficiency level.
Source: Authors' analysis of data from Rhode Island Department of Education.

Table C3. Accelerated college credit program students by the characteristics of their first high school, 2013/14 grade 9 cohort

School characteristics	All students in cohort		Any college credit program		College credit program participation					
					Any dual enrollment		Any concurrent enrollment		Took any AP test	
	N	Percent	*N*	Percent	*N*	Percent	*N*	Percent	*N*	Percent
Locale										
Rural	828	9.5	366	10.2	20	6.0	273	12.3	229	9.7
Suburban	5,808	66.6	2,438	68.0	127	37.8	1,661	74.7	1,629	68.8
Urban	1,916	22.0	751	20.9	183	54.5	269	12.1	485	20.5
Urban ring	174	2.0	31	0.9	6	1.8	20	0.9	24	1.0
Driving distance to nearest Rhode Island public college campus										
< = 1 mile (within walking distance)	537	6.2	161	4.5	98	29.2	35	1.6	47	2.0
1–8 miles	5,581	64.0	2,279	63.6	183	54.5	1,449	65.2	1,494	63.1
> 8 miles	2,608	29.9	1,146	32.0	55	16.4	739	33.2	826	34.9
Enrollment										
Small	707	8.1	290	8.1	55	16.4	190	8.6	134	5.7
Medium	2,461	28.2	2,303	64.2	236	70.2	1,297	58.3	1,646	69.6
Large	5,558	63.7	993	27.7	45	13.4	736	33.1	587	24.8
Star school accountability rating (5 indicates best rating)										
1	1,351	15.9	396	11.2	61	18.9	169	7.7	265	11.4
2	1,729	20.4	532	15.1	124	38.5	346	15.7	262	11.3
3	2,693	31.8	972	27.6	69	21.4	663	30.1	630	27.2
4	2,255	26.6	1,273	36.1	61	18.9	899	40.8	852	36.7
5	450	5.3	352	10.0	7	2.2	125	5.7	310	13.4

AP is Advanced Placement.

Note: The sample size is 8,726 students who were first-time ninth graders in 2013/14. The sample size is 8,478 for Star rating because 248 students attended schools with no Star rating. *N* is number of students. State agencies in Rhode Island commonly use the term "urban" to refer to the cities of Central Falls, Newport, Pawtucket, Providence, and Woonsocket, and "urban ring" to refer to the surrounding municipalities of Cranston, East Providence, North Providence, Warwick, and West Warwick. Enrollment categories are defined thus: small equals less than 500 students, medium equals 500–1,199, and large equals 1,200 or higher.

Source: Authors' analysis of data from Rhode Island Department of Education.

Table C4. Economically disadvantaged students: Accelerated college credit program student characteristics, 2013/14 grade 9 cohort

Characteristics in grade 8	Economically disadvantaged students in cohort (*N* = 4,144)		College credit program participation							
			Any college credit program		Any dual enrollment		Any concurrent enrollment		Took any Advanced Placement test	
	N	Percent	*N*	Percent	*N*	Percent	*N*	Percent	*N*	Percent
Male	2,126	51.3	449	37.6	66	31.3	230	36.5	264	39.1
Racial/ethnic minority	2,467	59.5	798	66.9	158	74.9	380	60.2	466	68.9
Has IEP	859	20.5	72	6.0	18	8.5	41	6.5	20	3.0
Multilingual learner	383	9.2	88	7.4	14	6.6	55	8.7	48	7.1
Has 1 or more suspensions	706	17.0	87	7.3	25	11.9	42	6.7	35	5.2
Chronic absence (10+)	1,063	25.7	174	14.6	46	21.8	92	14.6	75	11.1
NECAP math:										
Substantially below Proficient	1,518	36.7	219	18.4	55	26.1	120	19.0	89	13.2
Partially Proficient	936	22.6	218	18.27	52	24.6	101	16.0	110	16.3
Proficient	1,452	35.1	598	50.1	90	42.7	311	49.3	353	52.2
Proficient with Distinction	233	5.6	158	13.2	14	6.6	99	15.7	124	18.3

AP is Advanced Placement. IEP is individualized education program. *N* is number of students. NECAP is New England Common Assessment Program.
Note: The sample size is 4,144 students who were first-time ninth graders in 2013/14 and eligible for the National School Lunch Program. The sample size is 4,139 for NECAP math. There are five cases with NECAP scores but no proficiency level.
Source: Authors' analysis of data from Rhode Island Department of Education.

Table C5. Economically disadvantaged students: Accelerated college credit program students by the characteristics of their first high school, 2013/14 grade 9 cohort

School characteristics	Economically disadvantaged students in cohort (*N* = 4,144)		College credit program participation							
			Any college credit program		Any dual enrollment		Any concurrent enrollment		Took any AP test	
	N	Percent	*N*	Percent	*N*	Percent	*N*	Percent	*N*	Percent
Locale										
Rural	207	5.0	59	5.0	4	2.0	44	7.0	29	4.3
Suburban	2,443	59.0	585	49.0	56	26.5	413	65.5	308	45.6
Urban	1,418	34.2	541	45.4	149	70.6	169	26.8	336	49.7
Urban ring	76	1.8	8	1.0	2	1.0	5	1.0	3	0.0
Driving distance to nearest Rhode Island public college campus										
< = 1 mile (within walking distance)	449	10.8	138	11.6	81	38.4	32	5.1	43	6.4
1–8 miles	2,878	69.5	883	74.0	115	54.5	483	76.6	536	79.3
> 8 miles	817	19.7	172	14.4	15	7.1	116	18.4	97	14.4
Enrollment										
Small	442	10.7	158	13.2	42	20.0	80	12.7	69	10.2
Medium	2,712	65.4	818	68.6	149	70.6	379	60.1	522	77.2
Large	990	23.9	217	18.2	20	9.5	172	27.3	85	12.6
Star school accountability rating (5 indicates best rating)										
1	1,195	29.9	341	29.5	52	25.9	141	22.5	225	34.6
2	998	25.0	254	22.0	93	46.3	139	22.2	104	16.0
3	1,191	29.8	293	25.3	39	19.4	213	34.0	130	20.0
4	460	11.5	146	12.6	11	5.5	101	16.1	79	12.1
5	155	3.9	123	10.6	6	3.0	32	5.1	113	17.4

AP is Advanced Placement. *N* is number of students.

Note: The sample size is 4,144 students who were first-time ninth graders in 2013/14 and eligible for the National School Lunch Program. The sample size is 3,999 for Star rating because 145 students attended schools with no Star rating. State agencies in Rhode Island commonly use the term "urban" to refer to the cities of Central Falls, Newport, Pawtucket, Providence, and Woonsocket, and "urban ring" to refer to the surrounding municipalities of Cranston, East Providence, North Providence, Warwick, and West Warwick. Enrollment categories are defined thus: small equals less than 500 students, medium equals 500–1,199, and large equals 1,200 or higher.

Source: Authors' analysis of data from Rhode Island Department of Education.

Table C6. Observed percentage of students attaining outcomes, 2013/14 grade 9 cohort

Outcomes	All students in cohort		Any college credit program		College credit program participation					
					Any dual enrollment		Any concurrent enrollment		Took any Advanced Placement test	
	N	Percent	*N*	Percent	*N*	Percent	*N*	Percent	*N*	Percent
Total	8,726	100.0	3,586	41.1	336	3.9	2,223	25.5	2,367	27.1
Graduated from high school	7,150	81.9	3,458	96.4	322	95.8	2,140	96.3	2,287	96.6
Enrolled in college within one year of graduation	5,366	61.5	3,155	88.0	270	80.4	1,999	90.0	2,165	91.5

AP is Advanced Placement. *N* is number of students from a cohort who were first-time ninth graders in 2013/14.
Source: Authors' analysis of data from Rhode Island Department of Education.

Table C7. Regression coefficients (odds ratios), 2013/14 grade 9 cohort

Variable	High school graduation		Enrollment in college	
	Odds ratio	Standard error	Odds ratio	Standard error
Student-level				
Intercept	8.67***	3.17	1.75**	0.32
Participation in any accelerated college credit program	8.69***	1.20	5.21***	0.42
NECAP math score	0.99	0.01	1.03***	0.01
Eligible for National School Lunch Program	0.68**	0.09	0.62***	0.06
Racial/ethnic minority	0.73*	0.11	1.16	0.13
School-level				
Percent students eligible for National School Lunch Program	0.70	0.40	0.66	0.20
Percent multilingual learner students	0.01*	0.03	0.19	0.20
Percent students with IEP	0.12	0.25	0.19	0.53
Variance components				
Between-school variance (τ_{00})	0.49	0.13	0.06	0.03

* $p < .05$; ** $p < .01$; *** $p < .001$.
IEP is individualized education program. NECAP is New England Common Assessment Program.
Note: The sample size is 3,916 students who were first-time ninth graders in 2013/14 clustered in 57 high schools. Shown are estimated coefficients from two-level logistic regression models, fit separately for each of the two outcomes.
Source: Authors' analysis of data from Rhode Island Department of Education.

Table C8. Predicted probabilities from regression of any accelerated college credit program participation on each outcome, 2013/14 grade 9 cohort

	Graduated high school		Enrolled in college within one year of graduation	
Variable	Probability	Standard error	Probability	Standard error
Participation in any accelerated college credit program				
Yes	0.96***	0.01	0.84***	0.01
No	0.75	0.02	0.54	0.01

* $p < .05$; ** $p < .01$; *** $p < .001$.
Note: The sample size is 3,916 students clustered in 57 high schools in a matched sample drawn from students who were first-time ninth graders in Rhode Island public schools in 2013/14. Predicted probabilities are estimated from the regression analysis displayed in table C7. The model included student and school covariates (not shown in this table) as listed in table B1, appendix B.
Source: Authors' analysis of data from Rhode Island Department of Education.

Table C9. Observed rate of enrollment during first year of college in developmental education courses by accelerated college credit program participation, among students who enrolled at a Rhode Island public college, 2013/14 grade 9 cohort

Outcomes	All students in cohort enrolled in RI public colleges (*n* = 3392)		College credit program participation							
			Any college credit program (*n* = 1707)		Any dual enrollment (*n* = 198)		Any concurrent enrollment (*n* = 1062)		Took any Advanced Placement test (*n* = 1067)	
	N	Percent	*N*	Percent	*N*	Percent	*N*	Percent	*N*	Percent
Enrolled in developmental education course(s)	1259	37.1	331	19.4	62	31.3	189	17.8	140	13.1

AP is Advanced Placement. *N* is number of students within a cohort of first-time ninth graders in 2013/14. Developmental education enrollment was available only for the student's first year enrolled after the student graduated from high school.
Note: Fifteen percent of students participated in more than one program type.
Source: Authors' analysis of data from Rhode Island Department of Education.

Table C10. Relationship of accelerated college credit program participation to developmental education course enrollment in first year at a Rhode Island public college: Relative risk ratios, 2013/14 grade 9 cohort

Variable	Relative risk ratio	Standard error
Base outcome: Enroll in a Rhode Island public college, no developmental education courses		
Outcome 1: Enroll in a Rhode Island public college, take developmental education course(s)		
Participation in any accelerated college credit program	**0.35*****	**0.04**
NECAP math score	0.90***	0.01
Eligible for National School Lunch Program	1.36*	0.17
Racial/ethnic minority	0.92	0.14
School: Percent students eligible for National School Lunch Program	1.39	0.61
School: Percent multilingual learner students	0.42	0.58
School: Percent students with IEP	1.03	1.15
Intercept	0.81	0.21
Outcome 2: Enroll in another type of college		
Participation in any accelerated college credit program	1.18	0.11
NECAP math score	0.99	0.01
Eligible for National School Lunch Program	0.73*	0.09
Racial/ethnic minority	1.05	0.16
School: Percent students eligible for National School Lunch Program	0.27**	0.11
School: Percent multilingual learner students	0.78	0.93
School: Percent students with IEP	2.09	2.21
Intercept	1.16	0.25
Outcome 3: Not enroll in college		
Participation in any accelerated college credit program	0.15***	0.02
NECAP math score	0.93***	0.01
Eligible for National School Lunch Program	1.65**	0.25
Racial/ethnic minority	0.85	0.12
School: Percent students eligible for National School Lunch Program	1.10	0.48
School: Percent multilingual learner students	4.00	4.56
School: Percent students with IEP	1.83	2.59
Intercept	1.98*	0.53

* $p < .05$; ** $p < .01$; *** $p < .001$.

IEP is individualized education program. NECAP is New England Common Assessment Program.

Note: The sample size is 3,916 students in a matched sample drawn from students who were first-time ninth graders in Rhode Island public schools in 2013/14. Developmental education course enrollment was available only for students who enrolled in a public college in the state, and only for the student's first year enrolled after the student graduated from high school. Relative risk ratios were obtained using a multinomial logistic regression model to estimate the probability of four postsecondary outcomes on the full sample of 3,916 students: (1) enrolling in a Rhode Island public college and taking developmental education courses, (2) enrolling in another type of college, and (3) not enrolling in college. The fourth outcome, enrolling in a Rhode Island public college and not taking developmental education courses, was the base outcome category against which the relative risk of each other outcome was compared. The relative risk ratio for accelerated college credit program participation for outcome 1 estimates the treatment effect on the relative likelihood of enrolling in developmental education courses in a Rhode Island public college versus enrolling in a Rhode Island public college but not taking developmental education courses, in the context of the likelihood of the two other outcomes. The regression model was a single-level model with cluster-adjusted standard errors to account for the clustering of students within high schools.

Source: Authors' analysis of data from Rhode Island Department of Education.

Table C11. Relationship of accelerated college credit program participation to developmental education course enrollment in first year at a Rhode Island public college: Predicted probabilities, 2013/14 grade 9 cohort

	Enroll in a Rhode Island public college, no developmental education courses		Enroll in a RI public college, take developmental education course(s)		Enroll in another type of college		Not enroll in college	
	Probability	Standard error	Probability	Standard error	Probability	Standard error	Probability	Standard error
Participation in any accelerated college credit program								
Yes	0.39***	0.01	0.14***	0.01	0.32***	0.02	0.15***	0.01
No	0.21	0.01	0.17	0.01	0.16	0.01	0.46	0.02

* $p < .05$; ** $p < .01$; *** $p < .001$.

Note: The sample size is 3,916 students in a matched sample drawn from students who were first-time ninth graders in Rhode Island public schools in 2013/14. Developmental education course enrollment was only available for students who enrolled in a public college in the state, and only for the student's first year enrolled after graduating from high school. Predicted probabilities were obtained using a multinomial logistic regression model (see table C10) to estimate the probability of four postsecondary outcomes on the full sample of 3,916 students: (1) enrolling in a Rhode Island public college and taking developmental education courses, (2) enrolling in another type of college, and (3) not enrolling in college. A fourth outcome, enrolling in a Rhode Island public college and not taking developmental education courses, was the base outcome category against which the relative risk of each other outcome was compared. The predicted probability associated with accelerated college credit program participation status for outcome 1 shows the treatment effect on the relative likelihood of enrolling in developmental education courses in a Rhode Island public college versus enrolling in a Rhode Island public college but not taking developmental education courses, in the context of the likelihood of the two other outcomes. The regression model was a single-level model with cluster-adjusted standard errors to account for the clustering of students within high schools.

Source: Authors' analysis of data from Rhode Island Department of Education.

Table C12. Odds ratios for interaction effects for treatment and economic disadvantage, 2013/14 grade 9 cohort

	Outcome			
	High school graduation		Enrollment in college	
Variable	Odds ratio	Standard error	Odds ratio	Standard error
Participation in any accelerated college credit program	7.12***	1.32	4.58***	0.49
Eligible for National School Lunch Program	0.64**	0.09	0.56***	0.06
Participation by eligibility [interaction term]	1.50	0.41	1.35	0.22

* $p < .05$; ** $p < .01$; *** $p < .001$.

Note: The sample size is 3,916 students clustered in 57 high schools in a matched sample drawn from students who were first-time ninth graders in Rhode Island public schools in 2013/14. Shown are coefficients from two-level logistic regression models, fit separately for each of the two outcomes, that included student and school covariates (not shown in this table) as listed in table B1, appendix B.

Source: Authors' analysis of data from the Rhode Island Department of Education.

Table C13. Predicted probabilities for interaction effects for treatment and economic disadvantage, 2013/14 grade 9 cohort

	Outcome:			
	High school graduation		Enrollment in college	
Variable	Probability	Standard error	Probability	Standard error
Participated in any accelerated college credit program				
Eligible for National School Lunch Program	0.95***	0.01	0.82***	0.01
Not eligible	0.96	0.01	0.86	0.01
Did not participate				
Eligible for National School Lunch Program	0.71***	0.03	0.45***	0.02
Not eligible	0.78	0.02	0.59	0.02

* $p < .05$; ** $p < .01$; *** $p < .001$.

Note: The sample size is 3,916 students clustered in 57 high schools in a matched sample drawn from students who were first-time ninth graders in Rhode Island public schools in 2013/14. Predicted probabilities are estimated from the regression analysis displayed in table C12. The model included student and school covariates (not shown in this table) as listed in table B1, appendix B.

Source: Authors' analysis of data from Rhode Island Department of Education.

Table C14. Summary of odds ratios from models examining the relationship between different forms of accelerated college credit program participation and outcomes, 2013/14 grade 9 cohort

	Outcome:			
	High school graduation		Enrollment in college	
Treatment indicator	Odds ratio	Standard error	Odds ratio	Standard error
Ever enrolled in a dual enrollment course	4.39***	1.38	2.73***	0.50
Ever enrolled in a concurrent enrollment course	4.68***	0.81	3.60***	0.36
Ever took an Advanced Placement test	6.14***	1.17	4.69***	0.53

* $p < .05$; ** $p < .01$; *** $p < .001$.

Note: The sample size is 3,916 students clustered in 57 high schools in a matched sample drawn from students who were first-time ninth graders in Rhode Island public schools in 2013/14. Shown are estimated coefficients from two-level logistic regression models, fit separately for the two outcomes. For each outcome, the model included a set of three treatment indicators—one for each accelerated college credit program. Students could participate in more than one program. The models summarized above included student and school covariates as listed in table B1, appendix B.

Source: Authors' analysis of data from Rhode Island Department of Education.

Table C15. Summary of predicted probabilities from models examining the relationship between different forms of accelerated college credit program participation and outcomes, 2013/14 grade 9 cohort

	Outcome			
	High school graduation		Enrollment in college	
Treatment indicator	Probability	Standard error	Probability	Standard error
Ever enrolled in a dual enrollment course				
Yes	0.95***	0.01	0.83***	0.02
No	0.84	0.01	0.68	0.01
Ever enrolled in a concurrent enrollment course				
Yes	0.95***	0.01	0.84***	0.01
No	0.82	0.02	0.63	0.01
Ever took an Advanced Placement test				
Yes	0.95***	0.01	0.87***	0.01
No	0.82	0.02	0.63	0.01

* $p < .05$; ** $p < .01$; *** $p < .001$.

Note: The sample size is 3,916 students clustered in 57 high schools in a matched sample drawn from students who were first-time ninth graders in Rhode Island public schools in 2013/14. For each outcome, the model included a set of three treatment indicators, one for each accelerated college credit program. Students could participate in more than one program. Predicted probabilities are estimated from the two regression analyses displayed in table C14. The models summarized above included student and school covariates as listed in table B1, appendix B.

Source: Authors' analysis of data from Rhode Island Department of Education.

Table C16. Sensitivity analysis on sample excluding students departing the Rhode Island public school system before grade 11: Odds ratios from models examining the relationship between different forms of accelerated college credit program participation and outcomes, 2013/14 grade 9 cohort

	Outcome			
	High school graduation		Enrollment in college	
Treatment indicator	Odds ratio	Standard error	Odds ratio	Standard error
Model 1:				
Participated in any accelerated college credit program	6.13***	0.91	4.12***	0.34
Model 2:				
Ever enrolled in a dual enrollment course	3.41***	1.16	2.49***	0.47
Ever enrolled in a concurrent enrollment course	3.40***	0.62	3.01***	0.31
Ever took an Advanced Placement test	4.92***	1.03	3.79***	0.43

* $p < .05$; ** $p < .01$; *** $p < .001$.

Note: The sample size is 3,696 students clustered in 58 high schools in a matched sample drawn from students who were first-time ninth graders in Rhode Island public schools in 2013/14 and had a high school enrollment record in 2015/16 and/or 2016/17. Shown are estimated coefficients from two-level logistic regression models, fit separately for the two outcomes. For participation in any program, a single binary indicator was entered in the model to represent treatment. For models analyzing outcomes associated with each program, the model included a set of three treatment indicators, one for each accelerated college credit program. Students could participate in more than one program. The models summarized above included student and school covariates as listed in table B1, appendix B.

Source: Authors' analysis of data from Rhode Island Department of Education.

Table C17. Odds ratios for interaction effects for treatment and race/ethnicity, 2013/14 grade 9 cohort

	Outcome					
	High school graduation		Enrollment in college		Enrolled in developmental education in first year of college in Rhode Island	
Variable	Odds ratio	Standard error	Odds ratio	Standard error	Odds ratio	Standard error
Participation in any accelerated college credit program	9.20***	1.79	4.55***	0.46	1.65**	0.25
Racial/ethnic minority	0.74**	0.11	1.03	0.13	0.85	0.12
Participation by racial/ethnic minority [interaction term]	0.89	0.24	1.43*	0.24	2.09***	0.42

* $p < .05$; ** $p < .01$; *** $p < .001$.

Note: The sample size is 3,916 students clustered in 57 high schools in a matched sample drawn from students who were first-time ninth graders in Rhode Island public schools in 2013/14. Shown are coefficients from two-level logistic regression models, fit separately for each of the two outcomes, that included student and school covariates (not shown in this table) as listed in table B1, appendix B.

Source: Authors' analysis of data from the Rhode Island Department of Education.

Table C18. Predicted probabilities for interaction effects for treatment and minority status, 2013/14 grade 9 cohort

	Outcome					
	High school graduation		Enrollment in college		Enrolled in developmental education in first year of college in Rhode Island	
Variable	Probability	Standard error	Probability	Standard error	Probability	Standard error
Participated in any accelerated college credit program						
Racial/ethnic minority	0.96***	0.01	0.82***	0.01	0.15***	0.01
White	0.95	0.01	0.87	0.01	0.16	0.01
Did not participate						
Racial/ethnic minority	0.72***	0.03	0.54***	0.02	0.12***	0.01
White	0.77	0.02	0.53	0.02	0.18	0.01

* $p < .05$; ** $p < .01$; *** $p < .001$.

Note: The sample size is 3,916 students clustered in 57 high schools in a matched sample drawn from students who were first-time ninth graders in Rhode Island public schools in 2013/14. Predicted probabilities are estimated from the regression analysis displayed in table C12. The model included student and school covariates (not shown in this table) as listed in table B1, appendix B.

Source: Authors' analysis of data from Rhode Island Department of Education.

Appendix D. Other analyses

The Rhode Island Department of Education (RIDE) requested information about two additional cohorts of students: the grade 9 cohorts of 2014/15 and of 2015/16. These cohorts were not included in the analyses featured in this report because data were incomplete. The 2015/16 grade 9 cohort did not have a baseline standardized assessment score available for grade 8, because the state transitioned from the New England Common Assessment Program (NECAP) to the Partnership for Assessment of Readiness for College and Careers assessments that year. In addition, both classes had graduated too recently for college enrollment data to be available to the state longitudinal data system.

Because detailed student-level information about dual and concurrent enrollment was not reported to the state agency until 2015/16, these two cohorts provide a more complete picture of enrollment in these programs than did the 2013/14 grade 9 cohort featured in the report. The 2014/15 grade 9 cohort has dual and concurrent enrollment data for grades 10–12, and the 2015/16 grade 9 cohort has data for the full high school grade span of grades 9–12 (table D1).

Table D1. Accelerated college credit program student characteristics, 2014/15 and 2015/16 grade 9 cohorts

Grade 9 cohort	All students in cohort	College credit program participation							
		Any college credit program		Any dual enrollment		Any concurrent enrollment		Took any Advanced Placement test	
	N	*N*	Percent	*N*	Percent	*N*	Percent	*N*	Percent
2014/15	9,172	4,132	45.1	450	4.9	2,476	27.0	2,914	31.8
2015/16	9,997	4,517	45.2	517	5.2	2,774	27.9	3,199	32.0

AP is Advanced Placement. *N* is number of students.
Source: Authors' analysis of data from Rhode Island Department of Education.

Tables D2 through D5 display the characteristics of students in the 2014/15 and 2015/16 grade 9 cohorts.

Table D2. Accelerated college credit program student characteristics, 2014/15 grade 9 cohort

Characteristics in grade 8	All students in cohort		College credit program participation							
			Any college credit program		Any dual enrollment		Any concurrent enrollment		Took any Advanced Placement test	
	N	Percent	*N*	Percent	*N*	Percent	*N*	Percent	*N*	Percent
Male	4,719	51.5	1,800	43.6	164	36.4	1,102	44.5	1,266	43.5
Racial/ethnic minority	3,350	36.5	1,300	31.5	236	52.4	641	25.9	882	30.3
National School Lunch Program eligible	4,548	49.6	1,473	35.7	267	59.3	767	31.0	949	32.6
Has IEP	1,293	14.1	156	3.8	31	6.9	91	3.7	60	2.1
Multilingual learner	480	5.2	125	3.0	19	4.2	68	2.8	70	2.4
Has 1 or more suspensions	897	9.8	118	2.9	33	7.3	56	2.3	59	2.0
Chronic absence (10+)	1,482	16.2	297	7.2	68	15.1	160	6.5	160	5.5
NECAP math:										
Substantially below Proficient	2,022	22.1	282	6.8	71	15.8	148	6.0	125	4.3
Partially Proficient	1,858	20.3	513	12.4	82	18.3	296	12.0	250	8.6
Proficient	3,730	40.7	2,056	49.8	215	47.9	1,252	50.6	1,397	48.0
Proficient with Distinction	1,559	17.0	1,280	31.0	81	18.0	780	31.5	1,141	39.2

AP is Advanced Placement. IEP is individualized education program. *N* is number of students. NECAP is New England Common Assessment Program.
Note: The sample is 9,172 students who were first-time ninth graders in 2014/15. For NECAP, the sample is 9,169 because there are three cases with NECAP scores but no proficiency level.
Source: Authors' analysis of data from Rhode Island Department of Education.

Table D3. Accelerated college credit program students by characteristics of their first high school, 2014/15 grade 9 cohort

School characteristics	All students in cohort		College credit program participation							
			Any college credit program		Any dual enrollment		Any concurrent enrollment		Took any Advanced Placement test	
	N	Percent	N	Percent	N	Percent	N	Percent	N	Percent
Locale										
Rural	783	8.6	402	9.7	33	7.3	263	10.6	273	9.4
Suburban	6,149	67.0	2,819	68.2	190	42.2	1,818	73.4	2,025	69.5
Urban	2,050	22.3	880	21.3	225	50.0	372	15.0	594	10.4
Urban ring	190	2.1	31	0.8	2	0.4	23	0.9	22	0.8
Driving distance to nearest Rhode Island public college campus										
< = 1 mile (within walking distance)	657	7.2	247	6.0	121	26.9	72	2.9	108	3.7
1–8 miles	5,848	63.8	2,546	61.6	259	57.6	1,580	63.8	1,821	62.5
> 8 miles	2,667	29.1	1,339	32.4	70	15.6	824	33.3	985	33.8
Enrollment										
Small	821	9.0	367	8.9	68	15.1	198	8.0	221	7.6
Medium	6,081	66.3	2,823	68.3	309	68.7	1,593	64.3	2,109	72.4
Large	2,270	24.8	942	22.8	73	16.2	685	27.7	584	20.0
Star school accountability rating (5 indicates best rating)										
1	1,400	15.7	436	10.7	61	13.8	172	7.0	322	11.2
2	1,909	21.5	728	17.9	170	38.6	457	18.6	394	13.7
3	2,829	31.8	1,168	28.7	91	20.6	737	30.1	846	29.5
4	2,239	25.2	1,288	31.6	101	22.9	870	35.5	916	31.9
5	516	5.8	456	11.2	18	4.1	216	8.8	392	13.7

AP is Advanced Placement. *N* is number of students.

Note: The sample is 9,172 students who were first-time ninth graders in 2014/15. For Star rating, the sample is 8,893 because 279 students attended schools with no Star rating. State agencies in Rhode Island commonly use the term "urban" to refer to the cities of Central Falls, Newport, Pawtucket, Providence, and Woonsocket, and "urban ring" to refer to the surrounding municipalities of Cranston, East Providence, North Providence, Warwick, and West Warwick. Enrollment categories are defined thus: small equals less than 500 students, medium equals 500–1,199, and large equals 1,200 or higher.

Source: Authors' analysis of data from Rhode Island Department of Education.

Table D4. Accelerated college credit program student characteristics, 2015/16 grade 9 cohort

Characteristics in grade 8	All students in cohort		College credit program participation							
			Any college credit program		Any dual enrollment		Any concurrent enrollment		Took any Advanced Placement test	
	N	Percent	*N*	Percent	*N*	Percent	*N*	Percent	*N*	Percent
Male	5,129	51.3	1,901	42.1	140	27.1	1,195	43.1	1,347	42.1
Racial/ethnic minority	3,868	38.7	1,556	34.5	291	56.3	791	28.5	1,083	33.9
National School Lunch Program eligible	4,860	48.6	1,582	35.0	308	59.6	830	29.9	1,013	31.7
Has IEP	1,338	13.4	170	3.8	32	6.2	97	3.5	72	2.3
Multilingual learner	618	6.2	191	4.2	36	7.0	88	3.2	130	4.1
Has 1 or more suspensions	942	9.4	150	3.3	38	7.4	72	2.6	74	2.3
Chronic absence (10+)	1,823	18.2	382	8.5	87	16.8	200	7.2	210	6.6

AP is Advanced Placement. IEP is individualized education program. *N* is number of students. NECAP is New England Common Assessment Program.
Note: The sample size is 9,997 students who were first-time ninth graders in 2015/16. Grade 8 NECAP scores are not available for students in this cohort.
Source: Authors' analysis of data from Rhode Island Department of Education.

Table D5. Accelerated college credit program school characteristics, 2015/16 grade 9 cohort

School characteristics	All students in cohort		College credit program participation							
			Any college credit program		Any dual enrollment		Any concurrent enrollment		Took any AP test	
	N	Percent	*N*	Percent	*N*	Percent	*N*	Percent	*N*	Percent
Locale										
Rural	819	8.2	404	8.9	18	3.5	236	8.5	315	9.9
Suburban	6,603	66.1	3,029	67.1	221	42.8	2,048	73.8	2,126	66.5
Urban	2,393	12.9	1,041	23.1	277	53.6	459	16.6	724	22.6
Urban ring	182	1.8	43	1.0	1	0.2	31	1.1	34	1.1
Driving distance to nearest Rhode Island public college campus										
< = 1 mile (within walking distance)	772	7.7	295	6.5	137	26.5	74	2.7	162	5.1
1–8 miles	6,457	64.6	2,929	64.8	322	62.3	1,915	69.0	2,052	64.2
> 8 miles	2,768	27.7	1,293	18.6	58	11.2	785	28.3	985	30.8
Enrollment										
Small	1,186	11.9	500	11.1	101	19.5	291	10.5	299	9.4
Medium	6,326	63.3	2,949	65.3	300	58.0	1,690	60.9	2,220	69.4
Large	2,485	24.9	1,068	23.6	116	22.4	793	28.6	680	21.3
Star school accountability rating (5 indicates best rating)										
1	1,657	17.1	574	13.0	80	15.9	270	9.9	471	13.3
2	2,059	21.2	751	16.9	174	34.5	457	16.7	441	14.1
3	3,110	32.0	1,281	28.9	109	21.6	810	29.6	912	29.1
4	2,409	24.8	1,410	31.8	112	22.2	987	36.0	1,012	32.3
5	480	4.9	418	9.4	29	5.8	216	7.9	349	11.2

AP is Advanced Placement. *N* is number of students.

Note: The sample is 9,997 students who were first-time ninth graders in 2014/15. For Star rating, the sample is 9,715 because 282 students attended schools with no Star rating. N is number of students. State agencies in Rhode Island commonly use the term "urban" to refer to the cities of Central Falls, Newport, Pawtucket, Providence, and Woonsocket, and "urban ring" to refer to the surrounding municipalities of Cranston, East Providence, North Providence, Warwick, and West Warwick. Enrollment categories are defined thus: small equals less than 500 students, medium equals 500–1,199, and large equals 1,200 or higher.

Source: Authors' analysis of data from Rhode Island Department of Education.

Table D6 displays descriptive statistics for the attainment of the one outcome—high school graduation—available for both cohorts.

Table D6. Percentage of students graduating from high school, 2014/15 and 2015/16 grade 9 cohorts

	2014/15 cohort (*N* = 9,172)		2015/16 cohort (*N* = 9,997)	
Graduated from high school:	Number	Percent	Number	Percent
All students in cohort	7,646	83.4	8,151	81.5
Participation in any accelerated college credit program	4,069	98.5	4,409	97.6
No participation in any accelerated college credit program	3,577	71.0	3,742	68.3
Specific programs:				
Ever enrolled in a dual enrollment course	437	97.1	500	96.7
Ever enrolled in a concurrent enrollment course	2,446	98.8	2,715	97.9
Ever took an Advanced Placement test	2,891	99.2	3,151	98.5

N is number of students.
Source: Authors' analysis of data from Rhode Island Department of Education.

The research team applied the same propensity score estimation and matching specifications to the 2014/15 grade 9 cohort that were used for the 2013/14 cohort (see appendix B). Baseline equivalence after matching was not as satisfactory for this cohort, with the following covariates having standardized mean differences greater than 0.05 and less than 0.25: grade 8 NECAP mathematics score (-0.06), percentage of students in the school eligible for the National School Lunch Program (0.06), percentage of students in the school who were multilingual learners, and percentage of students in the school with an individualized education program (0.08). As noted in appendix B, these four measures were included in all treatment estimation regression models for all cohorts to minimize selection bias.

The research team attempted to create a matched sample in the 2015/16 grade 9 cohort but could not produce an acceptable level of baseline equivalence. The lack of a baseline standardized academic achievement measure may have contributed to the difficulty in achieving balance on other correlated baseline measures. Because matching did not produce appreciable benefits in the reduction of selection bias, the research team performed regression analyses on the unmatched sample of all cohort members, using the same model specifications as described for the 2013/14 grade 9 cohort in appendix B.

The results of regression analyses on these two additional cohorts are shown in tables D7 and D8.

Table D7. Summary of odds ratios from models examining the relationship between different forms of accelerated college credit program participation and high school graduation, 2014/15 and 2015/16 grade 9 cohorts

Treatment indicator	2014/15 grade 9 cohort (matched sample)		2015/16 grade 9 cohort (not a matched sample)	
	Odds ratio	Standard error	Odds ratio	Standard error
Participated in any accelerated college credit program	15.41***	2.56	18.15***	1.92
Model with specific program indicators:				
Ever enrolled in a dual enrollment course	4.28***	1.41	6.46***	1.70
Ever enrolled in a concurrent enrollment course	9.96***	2.41	7.61***	1.07
Ever took an Advanced Placement test	19.10***	5.72	15.24***	2.35

Note: For the 2014/15 9th-grade cohort, the sample size is 4,152 students in 57 high schools in a matched sample drawn from students who were first-time ninth graders in Rhode Island public schools in 2014/15. For the 2015/16 ninth grade cohort, the sample size is 9,997 students in 65 high schools drawn from students who were first-time ninth graders in Rhode Island public schools in 2015/16. The latter cohort sample is not matched because a baseline grade 8 standardized assessment score was not available. Odds ratios were estimated from multilevel logistic regression models. The models summarized in this table included student and school covariates as listed in table B1, appendix B.
Source: Authors' analysis of data from Rhode Island Department of Education.

Table D8. Summary of predicted probabilities from models examining the relationship between different forms of accelerated college credit program participation and high school graduation, 2014/15 and 2015/16 grade 9 cohorts

Treatment indicator	2014–2015 grade 9 cohort (matched sample)		2015–2016 grade 9 cohort (not a matched sample)	
	Probability	Standard error	Probability	Standard error
Participated in any accelerated college credit program				
Yes	0.98***	0.00	0.97***	0.00
No	0.76***	0.01	0.69***	0.01
Ever enrolled in a dual enrollment course				
Yes	0.96***	0.01	0.96***	0.01
No	0.87***	0.01	0.80***	0.01
Ever enrolled in a concurrent enrollment course				
Yes	0.98***	0.01	0.96***	0.01
No	0.84***	0.01	0.78***	0.01
Ever took an Advanced Placement test				
Yes	0.98***	0.00	0.98***	0.00
No	0.83***	0.01	0.77***	0.01

Note: For the 2014/15 grade 9 cohort, the sample size is 4,152 students in 57 high schools in a matched sample drawn from students who were first-time ninth graders in Rhode Island public schools in 2014/15. For the 2015/16 grade 9 cohort, the sample size is 9,997 students in 65 high schools drawn from students who were first-time ninth graders in Rhode Island public schools in 2015/16. The latter cohort sample is not matched because a baseline grade 8 standardized assessment score was not available. For each outcome, the model included a set of three treatment indicators, one for each accelerated college credit program. Students could participate in more than one program. Predicted probabilities were estimated using multilevel logistic regression models (see table D7). The models summarized above included student and school covariates as listed in table B1, appendix B.
Source: Authors' analysis of data from the Rhode Island Department of Education.

Table D9 displays more detailed information about the high schools in which students participated in dual and concurrent enrollment programs. The 2015/16 grade 9 cohort is used because this cohort had complete participation data for grades 9–12.

Table D9. Schools in which at least 10 students participated in dual enrollment in the 2015/16 grade 9 cohort

	All schools represented in the cohort sample (*N* = 65)		Enrolled at least 10 students from the cohort in dual enrollment (*N* = 16)		Enrolled at least 10 students from the cohort in concurrent enrollment (*N* = 46)	
Locale						
Urban	22	33.85	8	50.00	12	26.09
Suburban	34	52.31	8	50.00	27	58.70
Rural	8	12.31	0	0.00	6	13.04
Urban-ring	1	1.54	0	0.00	1	2.17
Type						
Comprehensive	46	70.77	8	50.00	39	84.78
Vocational-technical	8	12.31	4	25.00	3	6.52
Charter	11	16.92	4	25.00	4	8.70
Total enrollment						
Large	7	10.77	4	25.00	7	15.22
Medium	35	53.85	8	50.00	32	69.57
Small	23	35.38	4	25.00	7	15.22

N is number of students.
Note: Enrollment categories are defined thus: small equals less than 500 students, medium equals 500–1,199, and large equals 1,200 or higher.
Source: Authors' analysis of data from Rhode Island Department of Education.