ON RAMP TO COLLEGE

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Dual Enrollment Impacts from the Evaluation of New York City's P-TECH 9-14 Schools

The New York City P-TECH Grades 9-14 (P-TECH 9-14) high school model involves a partnership between the New York City Department of Education, the City University of New York (CUNY), and employer partners that collaborate with the schools implementing it. The schools prepare students for both college and careers in science, technology, engineering, and mathematics (STEM) fields by allowing them to earn an applied associate degree in addition to a high school diploma and gain relevant work-based learning experiences within a six-year timeframe.

The P-TECH 9-14 model includes an accelerated schedule for earning high school course credits and passing statewide standardized tests, which are required for high school graduation and admission to most state colleges and universities. High school classes are front-loaded, and students take the New York State Regents exams early.[1] Passing the Regents exams early gives students the opportunity to enroll in college courses at CUNY while still in high school. This dual enrollment is a key component of the P-TECH 9-14 model and its career and technical education (CTE) curriculum. It exposes students to postsecondary education, allows them to earn college credit toward an associate degree, and complements their exploration of STEM careers. Students can start taking some Regents exams as early as the summer before ninth grade. They must pass the exams with college-ready scores in order to enroll at CUNY, and they can begin taking college courses in the tenth grade (Program Year 2). Box 1 describes CUNY's dual enrollment programs for high school students.

In the interim report on MDRC's ongoing evaluation of the model, the research team found significant impacts on P-TECH 9-14 students taking Regents exams and passing them with scores at the standard required for admission to CUNY. Specifically, by the end of two years of high school, 42 percent of P-TECH 9-14 students had passed the Regents English language arts exam with a score qualifying them for enrollment in CUNY courses, compared with 25 percent of a comparison group of students enrolled in other high schools. By the end of three years, the gap between the two groups was smaller but still favored P-TECH 9-14 students. There was also a positive impact on passing the Regents mathematics exam, with 43 percent of P-TECH 9-14 students passing it by the end of two years, compared with 40 percent of comparison group students, although the difference is not statistically significant. The research team concluded that P-TECH 9-14 students were better positioned to take college-level classes in high school than their counterparts in other schools. This brief examines whether P-TECH 9-14 students took advantage of the dual enrollment opportunities offered to them.

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BOX 1

DUAL ENROLLMENT IN NEW YORK CITY

New York City public school students have an opportunity to enroll in college-level classes during high school if they pass the New York State Regents English language arts and mathematics exams with scores that demonstrate college readiness, and which are higher than the scores required to graduate high school.

There are two City University of New York (CUNY) programs through which high school students can enroll in for-credit college courses: College Now and the Early College Initiative. Both programs operate at no cost to students and their families.* College Now is available to students at New York City high schools through partnerships with most CUNY campuses.† Students enrolled in College Now can earn up to 15 college credits while in high school. The Early College Initiative is only available to students attending early college high schools, which include all seven of the P-TECH 9-14 schools in this study, as well as 13 other schools in the city.‡ Students enrolled in Early College Initiative may be able to earn an associate degree over the course of their academic program, depending the school's model.

Previous research on dual enrollment at CUNY found positive impacts on postsecondary outcomes. Those who earned college credit through dual enrollment were 20 percentage points more likely to enroll in college after high school.§ These students also experienced reduced time to degree in college, took more college courses when enrolled in college, and earned higher college grade point averages.‖

NOTES: *The City University of New York, "College Now" (Website: https://k16.cuny.edu/collegenow/, 2021a); The City University of New York, "About Us" (Website: https://k16.cuny.edu/eci/about/, 2021b).

†The City University of New York (2021a).

‡The City University of New York (2021b).

§Tolani Britton, Birunda Chelliah, Millie Symns, and Vandeen Campbell, "College Now... or Later: Measuring the Effects of Dual Enrollment on Postsecondary Access and Success," EdWorkingPaper 19–118 (Providence, RI: Brown University, Annenberg Institute, 2019).

‖Drew Allen and Mina Dadgar, "Does Dual Enrollment Increase Students' Success in College? Evidence from a Quasi-Experimental Analysis of Dual enrollment in New York City," *New Directions for Higher Education* 2012, 158 (2012): 11–19.

THE P-TECH 9-14 MODEL'S IMPACT ON DUAL ENROLLMENT

This brief presents findings from an analysis of the P-TECH 9-14 model's impacts on students' dual enrollment outcomes, including whether students attempted and earned college credits in their second through fourth years of high school. The analysis, which is part of the continuing MDRC evaluation of the P-TECH 9-14 model, compares outcomes for P-TECH 9-14 students with those for students enrolled in other schools. As described in the interim report, the evaluation leverages the New York City high school admissions system, which applies a process that randomly assigns students to schools in cases when a school has more applicants than seats available, sometimes referred to as a lottery. For purposes of the study, the research team used this lottery to create two comparable

groups of students, one whose members were randomly offered admission to a P-TECH 9-14 school (P-TECH 9-14 group), and the other whose members were randomly offered seats in other schools (comparison group). For more information about the lottery and the study's design, see the interim report's Appendix A.

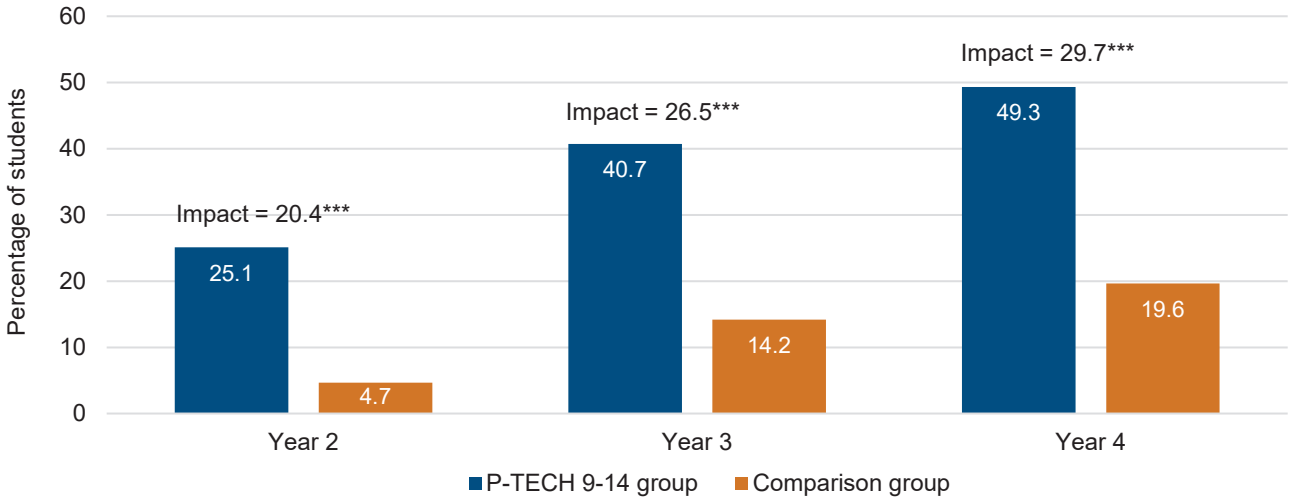
Students in P-TECH 9-14 schools typically begin to take college courses in their second year, but the pacing and progress of their college coursework varies by student. P-TECH 9-14 schools and partnering colleges together develop an ideal scope and sequence of courses for high school students who will dual enroll. College liaisons then work with individual students to plan their coursework once they are able to take college classes.

As shown in Figure 1, beginning in the second year of high school, P-TECH 9-14 students enrolled in college courses at consistently higher rates, compared with comparison group students, with the gap growing larger every year across the last three years of high school.[2] By the end of the second year, P-TECH 9-14 students dual enrolled at a rate 20 percentage points higher on average than that of comparison group students. By the end of four years of high school, the dual enrollment rate of P-TECH 9-14 students was nearly 30 percentage points higher than that of comparison group students.

P-TECH 9-14 students both attempted and earned more dual enrollment credits than students in the comparison group. Figure 2 shows that, by the end of the second year, P-TECH 9-14 students earned slightly more than one additional college credit on average than did comparison group students.

FIGURE 1

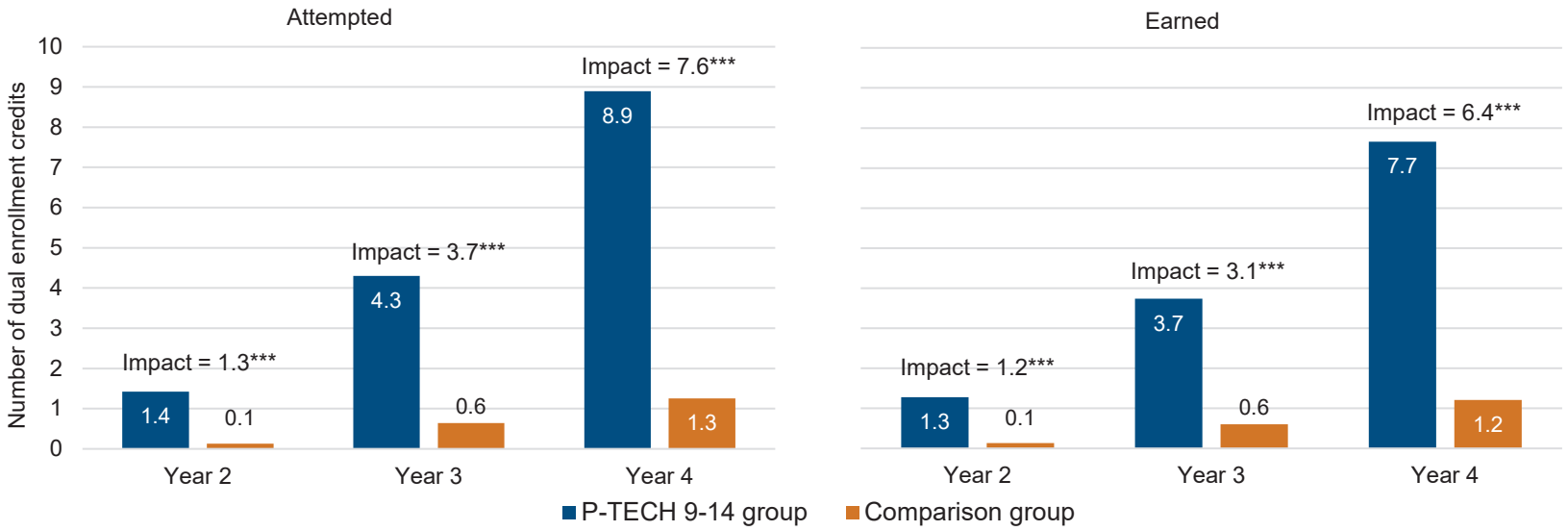
P-TECH 9-14 IMPACTS ON DUAL ENROLLMENT: PERCENTAGE OF STUDENTS DUAL ENROLLED, BY END OF EACH YEAR



NOTE: A two-tailed t-test was applied to the estimated difference. Statistical significance levels are indicated as follows: *** = 1 percent; ** = 5 percent; * = 10 percent.

FIGURE 2

P-TECH 9-14 IMPACTS ON DUAL ENROLLMENT: CUMULATIVE DUAL ENROLLMENT CREDITS STUDENTS ATTEMPTED AND EARNED, BY END OF EACH YEAR



NOTE: A two-tailed t-test was applied to the estimated difference. Statistical significance levels are indicated as follows: *** = 1 percent; ** = 5 percent; * = 10 percent.

Given that most college courses are three credits, this difference is equivalent to an extra third of a college semester class. By the end of the fourth year of high school, P-TECH 9-14 students earned 6.4 more credits on average than comparison group students, which is equivalent to about two more college courses. A typical full-time college semester at CUNY is 12 to 15 credits, which means that, on average, P-TECH 9-14 students were about a half of a semester in college coursework ahead of comparison group students at the end of four years of high school.[3] For comparison, nationally, just 11 percent of students dual enroll in college during high school, and the average number of college credits these students earn is 2.5.[4]

Among the students who enrolled in college-level courses at CUNY, there were key differences between the two research groups in the subject areas of the courses taken. Notably, P-TECH 9-14 students took more courses in areas aligned with their schools' CTE curricula such as information technology or computer programming, mathematics, and engineering. Table 1 describes these differences.

TABLE 1

DIFFERENCES IN DUAL ENROLLMENT SUBJECT AREA, BY STUDY GROUP

SUBJECT AREA	P-TECH 9-14 (%)	COMPARISON (%)
Social sciences	21.6	27.5
Information technology/computer programming	16.9	3.3
Mathematics	14.4	7.2
English	11.9	11.8
Communications and business	11.5	14.7
Engineering	10.7	1.0
Natural sciences	3.7	5.9
Health sciences	2.6	3.9
College, careers, and advising	0.9	8.0
Other	5.9	16.7

GENDER DIFFERENCES IN DUAL ENROLLMENT

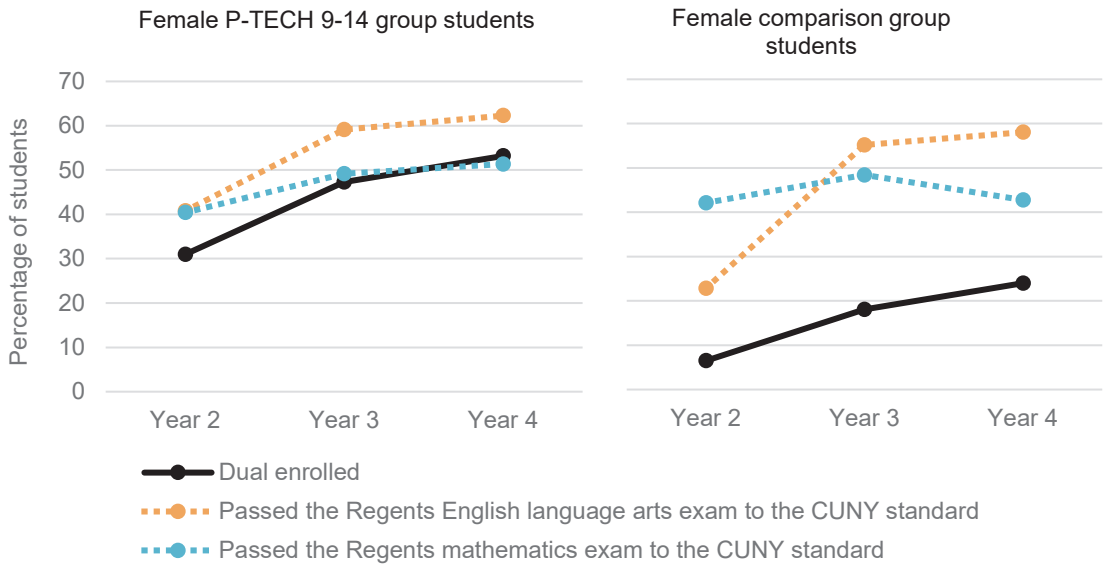
The research team also conducted an analysis of the impacts on dual enrollment outcomes for subgroups of male and female students. Previous studies of CTE programs have found different effects for female and male students.[5] Notably, while studies have shown that several CTE programs have increased earnings for male students but not for female students, it has also been well documented for many years that female students enroll in postsecondary education at higher rates than male stu-

dents.[6] To understand these trends in the context of the P-TECH 9-14 model, which includes a CTE curriculum and is specifically designed to prepare students for college and careers in STEM fields, it is salient to examine whether the model has different effects on outcomes for female and male students.

The study sample had a higher proportion of male students (63 percent), and there were notable differences in dual enrollment by gender. Figure 3 illustrates the differences between the mean percentage of female students and that of male students in both study groups who dual enrolled, alongside differences in their Regents exam pass rates. These findings indicate that female students took college classes during high school at higher rates than their male counterparts in both P-TECH 9-14 schools and comparison schools. Additionally, the gap between female P-TECH 9-14 and comparison group students was larger than the gap between male P-TECH 9-14 and comparison group students until the fourth year of high school, when the impacts on dual enrollment were similar for both gender groups. Notably, the differences in dual enrollment rates between female and male students are statistically significant, while the small differences in Regents exam pass rates between female and male students are not. Moreover, the higher rate of dual enrollment among female students, versus male students, was consistent across all seven of the P-TECH 9-14 schools in the study sample.

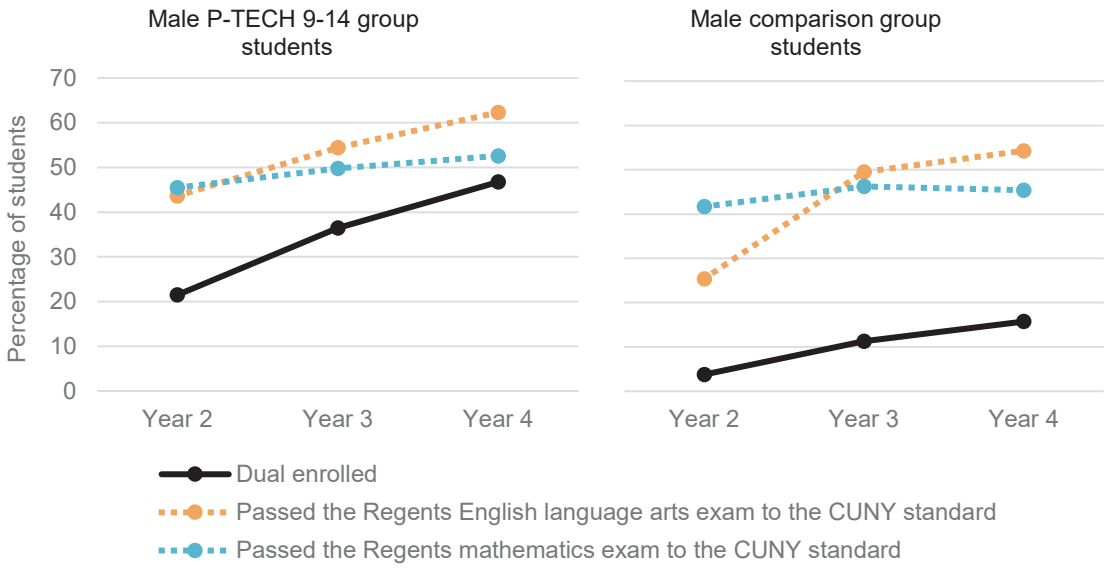
FIGURE 3

P-TECH 9-14 IMPACTS ON DUAL ENROLLMENT: PERCENTAGE OF STUDENTS DUAL ENROLLED AND PASSING THE REGENTS EXAMS TO THE CUNY STANDARD, BY GENDER



(continued)

FIGURE 3 (CONTINUED)



NOTE: Measures for passing the Regents exams to the CUNY standard are cumulative year over year; however, due to limited available data for more recent cohorts, the samples for the third and fourth years are smaller than the sample for the second year. Decreases in the percentage of students passing the Regents exams to the CUNY standard in the fourth year are due to this different cohort composition.

Further analyses, however, revealed that this difference in the rate of dual enrollment can be partially explained by differences in special education status between female and male students. While 21 percent of students in the study sample had special education designation, 78 percent of those students were male. When the research team analyzed the effects on dual enrollment for female and male students in general education alone, the impact for male students increased 4 percentage points from 31 to 35 percentage points by the end of the fourth year of high school, while the impact for female students remained the same at 29 percentage points.

LESSONS LEARNED AND LOOKING AHEAD

The P-TECH 9-14 model appears to have had positive effects on student outcomes: P-TECH 9-14 students dual enrolled at higher rates and both attempted and earned more college credits than comparison group students by the end of four years of high school. It is important to note that the students in the study sample had weaker academic performance in eighth grade than other students enrolled in P-TECH 9-14 schools.[7] Thus, these findings suggest that P-TECH 9-14 was particularly successful at helping students at risk of underperforming in high school achieve important academic milestones. In particular, it increased dual enrollment for this group of students, which may be significant

since prior research has found that students who take college courses while in high school are more likely to both enroll in college and complete postsecondary education degrees.[8]

The impacts on dual enrollment described in this brief are overall in line with the interim findings that P-TECH 9-14 students earned more total high school credits and took Regents exams and passed them with scores meeting CUNY's requirement for admission at higher rates than comparison group students. Together, the evaluation's findings so far show a pattern of progressive, positive impacts on students' high school outcomes, which should prepare them for a successful transition to postsecondary education and a career.

P-TECH 9-14 schools appear to have helped both female and male students successfully enroll in college courses while in high school, although they did not seem to completely address a persistent gender gap in this enrollment. This brief contributes to the literature on the gender gap in higher education. Previous research has attributed similar gender disparities in higher education to several factors including differences in academic grades, college admissions requirements, and students' school and curricular choices, among others.[9] In the P-TECH 9-14 evaluation, however, a larger proportion of the male students in the study sample had special education status, which contributed to the lower rate of dual enrollment among male students and may have been a driver of the other previously identified differences between male and female students in postsecondary education enrollment and attainment outcomes. The research team continues to evaluate the P-TECH 9-14 model and will examine academic outcomes, including high school graduation and postsecondary education outcomes, over the full six-year period of the P-TECH 9-14 high school model. The final report, expected to be released in 2023, will also include final implementation findings and a cost study.

NOTES AND REFERENCES

1 Rachel Rosen, D. Crystal Byndloss, Leigh Parise, Emma Alterman, and Michelle Dixon, *Bridging the School-to-Work Divide: Interim Implementation and Impact Findings from New York City's P-TECH 9-14 Schools* (New York: MDRC, 2020).

2 For the figures in this brief, calculations use New York City Department of Education (DOE) High School Application Processing System data and state test data for eighth-graders from the 2012-2017 academic years, data from DOE enrollment files from the 2012-2018 academic years, American Community Survey data for median household income by census tract from the 2012-2017 calendar years, and CUNY data on enrollment and courses taken from the 2013-2018 school years. The attempted credits measure include credits for all courses for which the student received either a passing or failing grade. (It does not include courses that awarded no grade.) The average number of credits per CUNY course is 3.1 among the courses taken by students in the study sample. In addition, the research team conducted Complier Average Causal Estimates (CACE), which increased the impacts slightly, similar to the CACE findings in the interim report.

3 Students who attend early college high schools and those who attend other high schools mostly participate in different CUNY dual enrollment programs. As a result, P-TECH 9-14 students overwhelmingly took courses through the Early College Initiative program, whereas comparison group students mostly took courses through the College Now program. The Early College Initiative and College Now programs have different grade thresholds for passing courses; specifically, College Now counts a course letter grade of D as a failing grade, whereas the Early College Initiative counts that same course grade of D as a passing grade. Given that

students from either program may enroll in the same college course at CUNY, it is possible that two students, one from Early College Initiative and the other from College, could receive the same grade in the same course but have different credit earning outcomes. The research team thus conducted a sensitivity analysis to examine whether the difference in the passing grade threshold between the two programs affected the impacts on dual enrollment outcomes. The analysis showed no significant differences in the findings even when it was conducted using a higher and equal grade threshold of a C for passing courses. This suggests that, while the Early College Initiative may have facilitated P-TECH 9-14 students in earning college credits more so than College Now may have facilitated comparison group students, this advantage was not related to former program's lower grade threshold for passing.

4 Laura Burns and Katherine Leu, *Advanced Placement, International Baccalaureate, and Dual-Enrollment Courses: Availability, Participation, and Related Outcomes for 2009 Ninth-Graders: 2013* (Washington, DC: National Center for Education Statistics, 2019).

5 Dylan Conger and Mark C. Long, "Why Are Men Falling Behind? Gender Gaps in College Performance and Persistence," *The Annals of the American Academy of Political and Social Science* 627, 1 (2010): 184–214; Dylan Conger and Mark C. Long, "Gender Gaps in College Enrollment: The Role of Gender Sorting Across Public High Schools," *Educational Researcher* 42, 7 (2013): 371–380; Nicole M. Fortin, Philip Oreopoulos, and Shelley Phipps, "Leaving Boys Behind: Gender Disparities in High Academic Achievement," *Journal of Human Resources* 50, 3 (2015): 549–579.

6 James J. Kemple, *Career Academies: Long-Term Impacts on Labor Market Outcomes, Educational Attainment, and Transitions to Adulthood* (New York: MDRC, 2008); Eric J. Brunner, Shaun M. Dougherty, and Stephen L. Ross, "The Effects of Career and Technical Education: Evidence from the Connecticut Technical High School System," *The Review of Economics and Statistics* (2021): 1–46; Thomas Snyder, Cristobal De Brey, and Sally A. Dillow, *Digest of Education Statistics, 2017* (Washington, DC: National Center for Education Statistics, 2019).

7 Rosen et al. (2020).

8 Brian P. An and Jason L. Taylor, "A Review of Empirical Studies on Dual Enrollment: Assessing Educational Outcomes," pages 99–151 in Michael B. Paulsen and Laura W. Perna (eds.), *Higher Education: Handbook of Theory and Research, Volume 34* (Berlin: Springer, 2019).

9 Dylan Conger, "High School Grades, Admissions Policies, and the Gender Gap in College Enrollment," *Economics of Education Review* 46, 1 (2015): 144–147; Dylan Conger and Mark C. Long, "Why Are Men Falling Behind? Explanations for the Gender Gap in College Outcomes," paper presented at the Texas Higher Education Opportunity Project Conference, Princeton, NJ (July 29, 2008); Fortin, Oreopoulos, and Phipps (2015).

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