ANNENBERG
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EdWorkingPaper No. 20-232

The Effects of Early College Opportunities on English Learners

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English Learners (ELs) lag behind their peers in postsecondary attainment. As the EL population in the U.S. continues to grow, so does concern over their underrepresentation in higher education. Research shows that Early College High Schools have a significant impact on high school and college outcomes for students from low income and racial/ethnic minority backgrounds, but how similar opportunities might extend to ELs remains unknown. We report findings from the first three years of an intervention that offers Early College opportunities in high schools serving large EL populations. Leveraging an exogenous policy change and rich administrative records, we examine the outcomes of pre- and post-program cohorts of ELs (N=15,090) in treated and untreated high schools. We find a large, significant impact on the number of college credits earned in 12th grade but no effect on immediate college attendance after high school. The probability of attending a four-year college significantly decreased.

VERSION: May 2020

Suggested citation: Johnson, Angela, and Diana Mercado-Garcia. (2020). The Effects of Early College Opportunities on English Learners. (EdWorkingPaper: 20-232). Retrieved from Annenberg Institute at Brown University: https://doi.org/10.26300/rg67-sh88

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Abstract

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Acknowledgements

This research is funded by the Stanford Graduate School of Education Incentive Funds, the Stanford Diversity Dissertation Research Opportunity, the Stanford Enhancing Diversity in Graduate Education Fellowship, and the Stanford Haas Center for Public Service Education Partnerships Small Grant. We are grateful for continued support from the anonymous district and helpful feedback from Eric Bettinger, Tom Dee, Mark Murphy, participants of the Center for Education Policy Analysis Seminar and the Association for Public Policy Analysis and Management Conference.

The Effects of Early College Opportunities on English Learners

Originally established in the 1970s to serve high-achieving students, dual enrollment has expanded substantially in the past decades (Kim, Kirby, & Bragg, 2006). According to the most recently available national data, approximately one-third of high school students have taken a dual enrollment course (Shivji & Wilson, 2019). This expansion correlates with research showing positive associations between dual enrollment and high school and college outcomes (Karp, Calcagno, Hughes, Jeong, & Bailey, 2007; Speroni 2011; Swanson 2008). Despite its growing popularity, however, not all students access dual enrollment opportunities at similar rates or benefit from participation in comparable ways (An, 2013a; An, 2013b; Fink, Jenkins, & Yanagiura, 2017; Nowicki, 2018).

Early College (EC), a special form of dual enrollment targeting low-income, first-generation, and racial/ethnic minority students, has emerged as a response. Located on or near college campuses, EC incorporates strategies specifically aimed at improving postsecondary outcomes for traditionally underrepresented students (Berger, Adelman, & Cole, 2010). For example, EC enrolls whole high schools of students in college courses, eliminating self-selection issues common in dual enrollment. Additionally, EC provides more intensive academic and social supports via advisories, mentoring, and tutoring (Born, 2006). Taken together the comprehensive elements of EC aim to expose students to college-level coursework, as in dual enrollment, while also integrating support systems to help underrepresented students succeed in their transition to college (Edmunds, 2016; Edmunds et al., 2017).

Although a number of quantitative and qualitative studies have investigated the ways in which EC programs affect students' academic outcomes and experiences (Berger et al., 2013; Haxton et al., 2016; Kaniuka & Vickers, 2010; Ongaga, 2010; Song & Zeiser, 2019), English

Learners (ELs) have been largely overlooked in this body of work for a couple of reasons. Given that ELs constitute a smaller proportion of students in high schools and have varying enrollment rates across states (McFarland et al., 2019), it has been difficult for researchers to obtain large enough samples to study causal effects of such programs (Berger et al., 2013). Additionally, postsecondary opportunities and outcomes for ELs have not been systematically tracked nor have they become a policy priority until more recently (Callahan & Shifrer, 2016; Kanno & Cromley, 2013; Kanno & Kangas, 2014).

Nevertheless, at the secondary level, ELs are a growing population comprising 6.4% of students nationwide and as much as 19% in states like California (ED Data Express, 2018). But ELs lag significantly behind their English-only peers when it comes to college access and postsecondary attainment—they drop out of high school at higher rates (Kanno & Cromley, 2013) and are less likely to have access to rigorous academic coursework while in high school (Callahan, 2005). Additionally, ELs are more likely to enroll in two-year colleges or not go to college at all than enroll in a four-year college (Kanno & Cromley, 2013; Kanno & Cromley, 2015). Offering improved postsecondary opportunities for ELs is an increasingly pressing concern but figuring out how to best serve these needs is complex. Adolescent ELs face multiple dimensions of disadvantage in postsecondary access and include a highly diverse group of individuals with varying linguistic and cultural backgrounds, educational histories, socioeconomic statuses, and socio-emotional needs (Santos et al., 2018).

Among the many obstacles ELs face in accessing postsecondary opportunities, limited exposure to college preparatory content is one of the most significant and well-studied challenges. The majority of adolescent ELs are concentrated in low-resource schools that offer few advanced academic courses and overrepresented in the low tracks within schools that do offer rigorous courses (Umansky, 2016; US Department of Education, 2018). EC's approach to dual enrollment, with its additional supports and whole-cohort enrollment, is well-positioned to address such issues.

This paper investigates the causal impact of a program that provides Early College opportunities, implemented in an urban district that serves a large adolescent EL population. The program offers opportunities to take courses in one of several pathways designed to lead to a certificate or two-year degree. Unlike other studies of EC, the majority of participants in this study are ELs. Leveraging rich longitudinal administrative data from the district, we present the first causal evidence of the effects of Early College opportunities on ELs' high school and college outcomes. We estimate program impact using a difference-in-differences design, which improves upon propensity score matching methods employed by earlier dual enrollment studies that report EL outcomes. In addition, this study contributes to the burgeoning literature on EL college access by providing the first causal findings from California, which have high generalizability to other states and districts with high concentrations and growing rates of adolescent EL enrollment.

Early College Research

Early College (EC) is a type of dual enrollment program designed to address concerns about college access through school-wide participation in college-level coursework and more intensive academic and social supports for students. Through collaborations between districts and colleges, high school students take substantial portions of their courses on college campuses. Varying models of EC exist, but a primary goal of these programs is to ease the transition to college among traditionally underrepresented students by exposing students to rigorous, college-level coursework while still receiving guidance and reinforcement from high school staff (Berger et al., 2010). In EC programs, high school staff offer extended support services for students through structured advisories and tutoring, as well as through informal academic and college counseling and mentoring (Berger et al., 2013; Edmunds et al., 2010; Lieberman, 2004; Song & Zeiser, 2019).

As such, EC aims to improve postsecondary success via a four-pronged approach: (1) it eliminates self-selection issues commonly experienced in dual-enrollment programs through whole-school enrollment, (2) it provides academic and social supports that enhance the experience of traditionally underrepresented students who might require additional assistance, (3) it eases the transition into college by exposing students to rigorous, college-level coursework, and (4) it promotes college credit accumulation to give students an academic head start that may provide a momentum for students in their postsecondary trajectory.

Early College and Dual Enrollment

Only a few studies thus far have investigated the impact of EC on academic outcomes. Using an experimental design, Berger et al. (2013) showed that attending an EC high school led to an increase in college credit completion and in certificate and AA completion. Edmunds and colleagues (2010, 2012) also found that 9th graders randomly assigned to participate in EC took and completed more college preparatory classes and had higher high school attendance and lower suspension rates than control students. In interviews, EC participants also reported benefiting from higher academic and social expectations from the faculty, trusting relationships with caring adults, and accountability among peers (McDonald & Farrell, 2012; Thompson & Ongaga, 2011).

However, this line of research has reported findings mostly on white participants (e.g. Edmunds et al., 2010; Edmunds et al., 2009)—and, to date, no study has rigorously studied the causal impact of EC on academic outcomes using a large EL sample. Berger et al. (2013) explored the differential effect of EC by race, as well as gender, income, first-generation college attendance, and middle school achievement. They found that EC impact on high school graduation and postsecondary enrollment did not differ significantly along those dimensions; however, the effect on college degree *completion* was stronger for women, minorities, low income students, and students with high middle school achievement.

Only one propensity score matching study, with a small EL sample, has explored the effect of dual enrollment and EC on ELs. Haskell (2016) found that ELs, who comprised 5.5% of study participants, had the lowest credit accumulation level among all subgroups. However, participation was associated with higher probability of EL enrollment in any higher education and degree completion and shorter time to associate's and bachelor's degrees. Unfortunately, this study does not present a *causal* link between EL dual enrollment and academic outcomes. Students self-select into dual enrollment. Propensity score matching can control for observed student characteristics but cannot account for unobserved factors that may be key to academic success. Robust experimental or quasi-experimental designs are needed to obtain causal estimates.

While our knowledge of EC is limited, a larger body of research on dual enrollment offers suggestive evidence about the potential benefits of taking college courses in high school. After controlling for student background and prior achievement, dual enrollment participants were more likely to immediately enroll in college after high school, persist to second year, and have lower rates of remediation and higher college GPA (e.g. Cowan & Goldhaber, 2015; Karp et al., 2007; Swanson, 2008). A few recent studies utilized propensity score matching and compared dual enrollment participants to non-participants from similar demographic background with similar pre-high school achievement (e.g. An, 2013a; An, 2013b; Blankenberger, Lichtenberger, & Witt, 2017; Haskell, 2016; Hughes, Rodriguez, Edwards, & Belfield, 2016). They found that dual enrollment participation was associated with higher standardized test scores, higher likelihood of high school graduation, more college credits earned during high school, shorter time-to-college-completion, and higher likelihood of degree attainment.

EL Access to Academic Content and College-Level Coursework

One of the main predictors of college success is academic preparedness and access to rigorous, college-level content (Nagaoka, Roderick, & Coca, 2009; Hein, Smerdon, & Sambolt, 2013). However, due to a combination of institutional-, classroom-, and student-level barriers, ELs often face unique challenges that limit their access to the type of academic content that would prepare them for postsecondary success (Kanno, 2018).

Adolescent ELs must acquire English language proficiency while simultaneously learning content across *multiple* academic subjects (Callahan & Shifrer, 2012). This must often occur in a shorter period of time for newly arrived, immigrant ELs (Carhill, Suarez-Orozco, & Paez, 2008) and usually when students are older, which can pose additional difficulties for language acquisition (Hakuta, Butler, & Witte, 2000). As a result, high schools face tradeoffs and often end up prioritizing second language acquisition as opposed to content learning (Kanno & Kangas, 2014). English language development (ELD) courses, for example, are often offered in blocked scheduling format. However, this type of scheduling has unintended consequences, such as limiting the number of courses that ELs can take and preventing ELs from completing other college prerequisites that are offered at the same time as ELD instruction (Lillie, Markos, Arias, & Wiley, 2012).

Although high schools face increasing pressure to offer opportunities that integrate both English language development and academic content in college-credit bearing coursework for ELs (Callahan & Shifrer, 2016), this type of integrated instruction can be challenging for high school teachers who must serve a highly diverse group of EL students (Dabach, 2014). Furthermore, even when EL students have access to academic content across multiple subject areas, the curriculum may not be conducive to their content learning (Valdes, 2001).

Additionally, school policies that use fluent English proficiency as a prerequisite can act as gatekeepers that deny ELs entry to advanced courses (Kanno & Kangas, 2014). These policies aim to ensure that students who require language support are placed in courses that are accessible academically and linguistically. When enforced uniformly across all academic subjects, however, the same policies can keep ELs out of advanced coursework in which they are capable of succeeding. ELs with high levels of preparation in specific academic subjects may stand to benefit from opportunities to take rigorous courses in those subjects outside the confines of the high school master schedule.

The EC model may be especially effective at addressing ELs' dual enrollment needs, as it breaks down several college-access barriers commonly faced by this student subgroup. Whole-school EC participation eliminates institutional-level factors that limit access to rigorous coursework common among ELs (Umansky, 2016), such as teacher recommendations or prior academic achievement. Additionally, EC eliminates the need for ELs to navigate the college application process and transportation requirements common in dual enrollment opportunities. In EC, students are registered by default and bused to the college campus as a group, substantially reducing transportation demands on their families (Cassidy, Keating, & Young, 2010). EC also offers opportunities to earn college credits at no or very little financial cost to the student, which may have strong effects on EL students. For example, states that offer undocumented students—a group that also includes current and former ELs—lower, in-state college tuition rates have had positive effects on high school graduation and postsecondary enrollment (Flores, 2010). Finally, EC provides extensive academic and social support to participants through advisories and tutoring. This can help EL students develop study skills and college transition knowledge that are crucial to college success (Conley, 2008).

Extending EC opportunities to EL students works to challenge traditional assumptions about the postsecondary aspirations and capabilities of ELs and offers new opportunities for this group of students. Compared to English-only students, ELs and their families, who are likely to have little experience with U.S. colleges, may be more strongly affected by the college experience and structured support provided by EC. Alternatively, this type of access to college-level classes may have unintended effects for ELs (Thompson, 2017)—for example, a college experience may demotivate students from pursuing postsecondary opportunities. To date, however, we know little about such effects because there has been no causal research on EL participation in EC programs.

Current Study

We examine a case of EC implemented by a large, urban school district in California. Leveraging rich administrative data and National Student Clearinghouse records on five cohorts of high school graduates, we look at the impact of whole school EC participation on ELs' 1) college credits earned in high school; 2) high school graduation; and 3) immediate college enrollment. We use a difference-in-differences design, comparing the differences in EL outcomes for graduation cohorts before and after EC implementation in treated and control high schools in the district. Enabled by this causal design and unique data that include a large number of ELs, this study expands our knowledge of whole-cohort dual enrollment and fills an important gap in the college access literature.

Study Context and Data

Data for this study come from a district in California that enrolls a large adolescent EL population. In this district, ELs comprise between 12% and 20% of students in 9th to 12th grade across its 17 high schools. The Early College program was an initiative co-designed by district administrators and the leadership at a high school that enrolls a large number of recently arrived, newcomer EL students. The design of the program aims to improve graduation rates as well as college opportunities for ELs.

According to the district, their adolescent ELs drop out of high school and do not continue into college for a couple of reasons. First, these students tend to be older than their grade-level peers and are therefore less interested in the high school curriculum. Instead, these students face more adult pressures to obtain a job that can financially support their families. Although teachers and staff repeatedly communicate the value of a high school diploma to the students, many still choose early departure. The central aim of the EC program has been to address this issue by offering adolescent ELs the opportunity to gain college credits while still enrolled in high school. The school and district leaders who designed the program hoped that it would incentivize students to stay in school by providing access to a set of more rigorous courses and an "onramp" to a certificate or a degree, which leads to higher wages.

The district additionally noted that the goal of the EC program has been to provide all students, regardless of prior academic achievement, with access to postsecondary education that leads to employment. To this end, the program offers several pathways from which students may select, including media production, computer and information systems, and child development.

Each pathway includes a bundle of courses that leads to either a certificate or an associate degree. To make the curriculum linguistically accessible to ELs, the district worked with the college to select courses that do not have English language proficiency requirements or prerequisites. Upon completion of 12^{th} grade courses, students earn up to half the credits required for a certificate, which is roughly equivalent to a quarter of an associate degree.

The program started in spring 2017 and has been implemented thus far in three high schools. Each of the three high schools enrolls between 300 and 500 students. At all three schools, the program is rolled out first to 12^{th} then 11^{th} grade, with a long-term plan of expanding participation to 10^{th} and 9^{th} graders. In spring 2017, the first high school ("HS1", 80% current EL), whose leadership played a seminal role in the program's design, restructured its master schedule to offer all 12^{th} grade high school classes in the morning. The entire 12^{th} grade class was bused every afternoon to take college-level classes at a nearby community college. A second high school ("HS2", 10% current EL) followed suit in fall 2017, after seeing the program implemented in HS1. The third high school ("HS3", 53% current EL) implemented the program in fall 2018. The EC program was designed and announced at each school just prior to the beginning of the academic year of implementation.

Student self-selection into the program was very unlikely. Families in the district may choose high schools through a rank-and-assignment procedure, but the 12^{th} graders affected by the program to date would not have known about the program when they made their school choices three years prior. Since all 12^{th} graders in the three schools participated, the effects of this program can be interpreted as the result of un-tracking and giving all students, including ELs, access to the same college-level course-taking opportunities.

Data

Administrative records, including National Student Clearinghouse (NSC) matches, are available for graduation cohorts 2013-2017 for all 17 high schools in the district. Our sample includes 15,090 students who were ever classified as EL upon enrolling in the district and attended one of the 17 high schools. Demographic data observed include gender, ethnicity, home language, and parent education level. We also have the students' high school transcripts and, for a sub-sample, AP and SAT scores. Table 1 shows the characteristics of students in the sample. About 47% of the sample is female. Slightly more than half identified as ethnically Chinese and 28% as Hispanic. Approximately 76% of the sample had reclassified before 11th grade. About a third of the students in the sample had parents who reported graduating from high school.

Our outcomes of interest are college credits earned during high school, on-time graduation, and immediate college enrollment. College credits are available for the full sample. Since only 12th graders were treated in the 2017 cohort, we use credits earned in 12th grade as the measure for college credits. Of the full sample, 85% were assigned a State of California high school graduation code and matched NSC records. The other 15% were not assigned a graduation code at the end of 12th grade and are regarded by the district as not having graduated on time. This is not uncommon, as the high schools in the district serve a large population of new immigrants, many of whom are expected to graduate within five instead of four years. For immediate college enrollment, we construct a measure for having enrolled in any certificate, 2-year, or 4-year college in the fall following the cohort's high school graduation. We impute a zero for immediate college enrollment for all students who are missing graduation because immediate college enrollment is very unlikely without an official record of high school completion.

We might expect the EC program to have a positive effect on college credits earned during high school and immediate college attendance after high school by building momentum toward certificate or degree completion. We might also see a small positive effect on high school graduation driven by cohorts expected to exit high school in 2018 or 2019. The cohort graduating in 2017 were only informed of the program and treated during their 12^{th} grade year, so we do not expect EC to affect their graduation rate. The cohorts of 2018 and 2019, on the other hand, may have felt incentivized by the EC opportunities to stay enrolled and complete high school. However, the direction of any potential effect on the probability of enrolling in a four-year college (as opposed to a two-year college) is ambiguous. After earning college credits during high school, students may feel empowered to enroll directly in a four-year college. Alternatively, they may decide to continue to enroll in the same two-year college after high school graduation or not enroll at all.

Research Design

We use a difference-in-differences (DiD) framework, which mimics an experiment. In a randomized experiment, subjects are randomly assigned to the treatment group or the control group; causal impact can be estimated by taking the difference between the outcomes of the two groups, as long as pre-treatment characteristics were equivalent across the groups. The DiD approach allows the analysis of panel data in a way that is analogous to an experimental design by using subjects' program eligibility and their data from time periods prior to program implementation and after program implementation. By interacting program eligibility with being observed in the post-program period, we interpret the interaction effect as the causal impact of the program, as long as pre-program outcome trends are parallel between the eligible and ineligible groups (Angrist & Pischke, 2009).

Eligibility for EC lends nicely to the construction of student groups to compare to those eligible to participate. ELs in the district were eligible to participate if they attended 12th grade in one of the three high schools. This means that students in other high schools and cohorts prior to 2017 were ineligible. The intersection of attending one of the three high schools ("Treated") and post-program graduating class ("Post") identifies eligibility. This allows us to compare outcomes using the DiD framework by applying the following model:

$$Outcome_{ics} = \beta_0 + \beta_1 Treated_s + \beta_2 Post_c + \beta_3 Treated_s \text{ x } Post_c + \delta\chi_{ics} + \alpha_s + \varepsilon_{ics} \quad (1)$$

in which for student i in cohort c in high school s:

Post = 1 if high school offered EC when cohort was in 12th grade;

Treated = 1 if student attended HS1, HS2, or HS3;

χ is a vector of student covariates;

α_s represents high school fixed effects;

ε represents errors clustered at the cohort-school level; and

β_3 is the coefficient of interest providing the effect of program eligibility on outcome.

This standard interaction approach has two shortcomings. First, if characteristics unique to post-program cohorts in the three treated high schools had contributed to differential performance, the design would not properly identify these effects. Second, DiD requires that outcome trends for the treated and control schools in the years prior to EC implementation to be parallel. If this "common trends" assumption is violated, the resulting estimate would be prone to bias (Angrist & Pischke, 2009). We plot the outcome trends for the treated schools and the control schools in Figure 1. Visual inspection provides some reassurance for the validity of the design. To further examine the validity of the control group as the counterfactual to the treated group, we perform several additional analyses.

First, we perform an event-study analysis on our EL sample by running the following model, which includes a full set of dummy variables that identify pre- and post-treatment years of program implementation (Angrist & Pischke, 2009):

$$Outcome_{ics=}\ \alpha_s + \gamma_c + \sum_{\tau=1}^{4} \delta_{-\tau} D_{s,c-\tau} + \sum_{\tau=0}^{2} \delta_{\tau} D_{s,c+\tau} + \beta X_{ics} + \epsilon_{ics} \quad (2)$$

Where α_s and γ_c represent school and cohort fixed effects. The parameter of interest is $\delta_{-\tau}$, which represents the effect of being in 12th grade τ years prior to the adoption of the Early College program (relative to being four years prior to adoption). If both treated schools and control schools had similar time-varying changes before the program was implemented, we can be more reassured about the two groups' having parallel trends.

Second, we leverage data on students in the same schools and cohorts who were never classified as ELs at any point during their time in the district. The EC program was designed to target ELs. Although non-ELs in the treated cohorts were ultimately offered the same course-taking opportunities, some of the targeted program features (e.g., college coursework and faculty that accommodate ELs) may have uniquely impacted ELs. We construct a comparison DiD (model 1) and event-study (model 2) using non-EL data to explore the extent to which the effects on ELs were unique. Although these non-EL results may not fully constitute naïve DiD estimates in a difference-in-differences-in-differences (DDD) design, they provide suggestive evidence for the validity of the counterfactual group. In the same vein, we also report DDD estimates, the results of netting out the non-EL DiD. The triple difference approach has more relaxed assumptions than DiD and would help address concerns over the short pre-trends.

Since the three high schools that have implemented the program all have enrollments of about 100 students per cohort, we restrict our analysis to smaller high schools in the district in two additional checks. First, we run the analysis on a restricted sample of only schools with fewer than 1000 students across the seven cohorts in the sample. Then, we repeat the analysis on a restricted sample of only schools with fewer than 700 EL students across the seven cohorts in the sample.

Lastly, we use the 14 control schools in the sample to construct synthetic units for the three treated high schools and conduct weighted DiD regressions. These sensitivity checks provide an indication for the robustness of our findings to only including control schools that are similar to treated schools in enrollment.

Findings

Difference-in-Differences

Table 2 shows the DiD estimates for the effects of EC opportunities on college credits earned, the probability of on-time high school graduation, immediately attending any (two- or four-year) college, and attending a four-year college. EC participation led to an increase of 10.5 college credits earned in the 12th grade, equivalent to two semester-long courses (column 1). The effect on on-time graduation is a significant 11.2 percentage point increase (column 2). EC opportunities had a very small (1.5 percentage point) effect on immediately college attendance after high school, which is not statistically significant (column 3). The estimated impact on first attending a four-year college after high school is -6.0 percentage points (column 4). The odds ratio estimates for the three binary outcomes (graduation, any immediate college enrollment, and enrolling in a four-year college) are all qualitatively similar to the linear probability estimates.

As shown in Table 3, synthetic control estimates are very close to these DiD estimates in both magnitude and significance.

Table 4 presents the event-study estimates for ELs. For college credits earned in 12th grade and attending a four-year college, the null estimates in the pre-program ("lead") years provide more reassurance that the outcome trends for treated and controls schools were parallel. For high school graduation and immediate college enrollment, the significant estimates for lead year 3 suggest some deviation from the common trends in that year. We consider this in our interpretation of the estimates on these two outcomes in the discussion section below. To further probe the validity of our EL DiD results, we examine the event-study estimates for ELs in smaller schools and for non-ELs in the district. As can be seen in Appendix Tables A1 and A2, similar significant estimates were found for lead year 3 in the two restricted samples for high school graduation and immediate college enrollment. As shown in Appendix Table A3, with the exception of four-year high school graduation in lead year 1, the other estimates provide evidence for parallel trends in the pre-program years. This further reassures us for the validity of the results for 12th grade college credits and four-year college but suggests we should interpret the estimates for high school graduation with caution.

DDD Results

Tables 5 presents DDD estimates, which provide an indication for EC's effects on ELs net of the effects on non-ELs in the same school. Estimates for college credits earned, high school graduation, and immediate college attendance are all small and insignificant. But the reduction in the probability of attending a four-year college remains large at 8.1 percentage points though insignificant, perhaps due to larger standard errors associated with DDD estimation. Non-EL DiD results (Appendix Table A5) show that non-ELs did not change their college sector choice as a result of EC participation (estimate = 0.002). This suggests that ELs were the ones driving the reduction in four-year college attendance.

Discussion

This study presents the estimated effects of a developing program that offers Early College opportunities based on the first three years of data. We find that EC participation increased the number of college credits earned during 12th grade by about one year-long college course. However, the program had no impact on the probability of enrolling in any college immediately after high school, and the probability of attending a four-year college significantly decreased as a result of participation. There is also suggestive evidence for a positive effect on high school graduation. We discuss each of these in detail below.

College Credits and Subsequent Attendance

Although participation in the Early College program led to a large and significant increase in the number of college credits earned in 12th grade, we found no impact on immediate attendance at any college. Given an increase in earned college credits while in high school, we might expect that students would have had momentum to continue in postsecondary enrollment after high school graduation. The earned college credits may have motivated students to pursue the benefits of a postsecondary education. However, we do not observe this. The program succeeded in inducing students to start college coursework, but it did not induce students to continue after high school. There are two potential explanations for this finding.

First, the difficulty of college-level coursework may have discouraged EL students from advancing in their postsecondary career. Teaching and learning at the community college level differ dramatically from high school. At the moment of high school to college transition, there can be a large gap in the level of academic rigor and social supports (Barnett, Corrin, Nakanishi, Bork, Mitchell, & Sepanik, 2012; Lee, 2012)—dual enrollment researchers warn about the unintended consequences of college exposure for students who are not prepared (Karp et al., 2007; Miller et al., 2018). This contrast is likely more pronounced for ELs, who may require even more support (Rodriguez & Cruz, 2009). At the secondary level, ELs primarily receive linguistic and academic content through either sheltered instruction or ESL support services (Calderón, Slavin, & Sánchez, 2011; Janzen, 2008). Although the EC program offered students high school-based tutoring and advising, high school teachers could not follow students into their college classrooms to provide support in real time. Despite efforts from the district to coordinate instruction, community colleges may also provide little to no accommodations for ELs in content classrooms. Indeed, in the first year of data collection, our preliminary survey data indicated that students perceived the difficulty of college classes to be their number one college-related concern.

If course-taking experience is sending negative signals to students and confirming lack of college readiness, then the null effect we see in immediate college-going would not be surprising. In fact, this may not be a negative impact. EC experiences are meant to provide first-generation students, including many ELs, with college information. When students decide not to enroll after high school, they are making an informed decision. This might be optimal for those who have very small probabilities of finishing a degree right after high school. Students in our survey, however, indicated paradoxical desires: high aspirations for obtaining a college degree and also securing a job to help their family—so, we might observe program effects in later years.

Secondly, the extra academic and logistical demands of the EC program may have caused students to experience burn-out. Many students experience "senioritis" and disengage from academic work in their 12th grade. Students in the EC program had to take college classes more difficult than any course they have ever experience during the spring semester of 12th grade. In order to do so, they had to ride busses to the college campus and forego extracurricular activities in the afternoons. All of this might have been physically and emotionally taxing. It is possible that instead of creating a momentum for college degree progress, the EC program acted as the last straw that "broke" the students' willingness to continue their education.

Starting at a Four-Year College

The program's negative effect on starting at a four-year college after high school merits attention. Starting at a four-year college after high school can be desirable because of certain better outcomes associated with the four-year sector. Four-year colleges have higher average degree completion rates compared to two-year colleges; and bachelor's degree holders enjoy higher median salary ($15,300 difference at age 25) and lower unemployment rates (0.2 percentage point difference) than associate's degree holders (Ma, Pender, & Welch, 2019). The negative estimated impact suggests that EC is inducing ELs, especially high-achieving ELs, to substitute out of the four-year sector and attend two-year colleges instead.

Just like in dual enrollment programs, college-level credits offered by the EC program are meant to incentivize students to complete more years of school than they otherwise would have chosen to. The intended consequence is to nudge students on the margin of deciding to attend college at all to enroll. This goal has not been realized, as reflected by the null effect on overall enrollment rates. There was another unintended consequence on the students on a different margin: higher-achieving students who would have attended college with or without the EC credits who were choosing between a two-year and four-year college. These students may have under-matched by choosing a two-year college as a result of their participation in EC. Based on the differential degree completion rates and labor market outcomes between the two college sectors, we might be concerned about the long-run effects of the program.

High School Graduation

We find suggestive evidence for a positive effect on high school graduation. This is worth further inquiry. Compared to non-ELs, high school ELs graduate on time at much lower rates (65% and 83%, respectively, ED Data Express, 2017). Data from the first year of our survey, which sampled 11^{th} and 12^{th} grade students in EC and control high schools, show that as many as one in three students reported having a close friend drop out of high school. This alarming figure is corroborated by administrative data from the district. More than 30% of students who enrolled in 9^{th} grade were missing enrollment records for either 11^{th} or 12^{th} grade. According to school administrators, many ELs feel that they have developed sufficient competency in the English language for survival and employment after spending one or two years in US schools; they then lose interest in school because they perceive there to be little value added for the high school diploma.

The program features of EC are intended to address this type of disengagement. Although we do not currently have credible causal evidence for a positive impact on high school graduation, the suggestive evidence is encouraging. It is possible that EC has not moved the needle on the margin of college attendance but is making a difference on the margin of high school graduation. By offering opportunities to earn credit toward a certificate that has financial returns, the program provides an incentive for students who would have otherwise left high school before 12^{th} grade to stay for the diploma. Currently, only 11^{th} and 12^{th} grader participate in the program. However, younger students and their families in the district are becoming more familiar with the program as time passes. If they perceive EC participation as an onramp to better labor market opportunities, 9th and 10th graders could be enticed to stay in school longer. Dual enrollment research suggests that earlier starts for these types of interventions may have greater effects (Fink et al., 2017).

Conclusion

Thus far we have looked at the impact of the Early College program on high school graduation and subsequent college enrollment for EL students. Our study contributes to the growing need to better understand the academic and postsecondary experiences of ELs. The results from our analysis suggest that the effects of EC may only partially extend to EL students in the same ways it does for other underrepresented groups, at least with regards to immediate and 4-year college enrollment. These results corroborate some descriptive case study research suggesting that removing institutional barriers to more rigorous coursework may be "necessary but not sufficient" for ELs (Thompson, 2017). While we are unsure about what may have led to such outcomes, existing research and results from our student surveys and interviews lead us to explore additional areas for investigation.

As previously stated, in order to meet the demands of English acquisition while simultaneously learning advanced academic content, adolescent ELs require courses that integrate both language and academic needs. However, much less focus has been placed on training college-level instructors in supporting language and academic development for ELs (Blumenthal, 2002; Oropeza, Varghese, & Kanno, 2010), especially those that come from a K-12 setting as opposed to adult English learners. The lack of coherence between secondary and postsecondary systems is certainly well-documented (Kirst & Venezia, 2004; Goldrick-Rab, 2010), but future research should also examine the types of professional development opportunities necessary to prepare college instructors to teach dual enrollment and EC program participants—especially when they include EL students from the K-12 system.

Much more remains to be studied in order to understand how to facilitate ELs' postsecondary experiences. We plan to investigate these matters in future work that traces student experiences through interviews more closely. Other future research also intends to examine the impact of EC on certificate and degree completion after these cohorts of EL students graduate from high school. The positive impacts in college credit accumulation while in high school signals the program was implemented as intended, and knowing these credits apply may incentivize EL students to enroll in college at later dates. Existing research examining the long-term effects of EC on student outcomes suggests that the effects of these types of programs continue for up to six years after high school graduation (Song & Zeiser, 2019). Perhaps the effects of EC will show in later years for the students in our sample.

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Table 1. Sample Summary Statistics

Student Characteristic	N	Mean
Female	15,090	.474
Chinese (ethnicity)	15,090	.522
Hispanic	15,090	.277
Mother HS Graduate	15,090	.338
Father HS Graduate	15,090	.312
EL in 11th Grade (classified in middle school)	15,090	.107
EL in 11th Grade (classified in Grades 2-5)	15,090	.057
EL in 11th Grade (classified in Grades K or 1)	15,090	.077
Reclassified before 11th Grade	15,090	.759
Special Education	15,090	.098
AP Exams Taken in 10th Grade	15,090	.231
Days Suspended in 10th Grade	15,090	.046

Note: Sample includes all students with complete data that were ever classified as English Learners in the district.

Table 2. DiD Estimates of Early College Program Impact on EL Academic Outcomes

Panel A: OLS Results	(1) 12th grade college credits	(2) 4-year graduation	(3) immediate college	(4) 4-year college
Post x Treated	10.518***	0.112***	0.015	-0.060**
	(0.733)	(0.031)	(0.031)	(0.026)
Post	0.428***	0.014**	-0.008	-0.009
	(0.092)	(0.006)	(0.008)	(0.008)
Treated	-0.960***	0.307***	0.089**	0.128***
	(0.230)	(0.042)	(0.043)	(0.021)
Constant	0.702	0.450***	0.475***	0.031
	(0.755)	(0.076)	(0.084)	(0.079)
Observations	15,090	15,090	15,090	15,090
R-squared	0.137	0.229	0.194	0.207
Pre-program difference	-0.960	0.307	0.089	0.128
Post-program difference	9.558	0.419	0.104	0.068

Panel B: Logistic Regression Results	(2) 4-year graduation	(3) immediate college	(4) four-year college
Post x Treated	1.517***	0.972	0.587***
	(0.244)	(0.143)	(0.103)
Constant	6.976***	2.138***	0.463***
	(0.758)	(0.170)	(0.035)
Observations	15,090	15,090	14,936

Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1. Estimates were obtained using DiD model (1). Sample includes students who have ever been classified as English Learners in grades K-12. Each column represents a separate regression. Column (1) reports the number of college credits earned in 12th grade. College credits from different colleges have been converted to a common scale. Ten credits are the equivalent of 2 semester-long courses or 1 year-long course. Columns (2)-(4) report binary dependent variables. Panel A reports linear probability estimates; Panel B reports odds ratios. "4-year graduation" represents having graduated from high school within 4 years of attendance. "immediate college" represents enrolling in college the fall after high school exit. "Four-year college" represents directly enrolling in a 4-year college after high school. Model includes student covariates (female, ethnicity, home language, mother's education, father's education, special education participation, 10th grade school suspensions, and AP tests taken prior to the end of 10th grade. Model includes high school fixed effects. Coefficients for control and FE are suppressed.

Table 3. Synthetic Control Estimates of Early College Program Impact EL Academic Outcomes

Panel A: OLS Results	(1) 12th grade college credits	(2) 4-year graduation	(3) immediate college	(4) 4-year college
Post x Treated	10.737***	0.101***	0.007	-0.042
	(0.757)	(0.035)	(0.033)	(0.029)
Post	0.373***	0.012	-0.004	-0.012
	(0.093)	(0.019)	(0.014)	(0.018)
Treated	0.012	-0.055***	-0.034*	-0.038**
	(0.063)	(0.019)	(0.018)	(0.018)
Constant	0.317	0.669***	0.625***	0.335***
	(1.111)	(0.122)	(0.166)	(0.110)
Observations	5,062	5,572	8,068	9,581
R-squared	0.331	0.192	0.182	0.182
Pre-program difference	0.012	-0.055	-0.034	-0.038
Post-program difference	10.749	0.046	-0.027	-0.080

Panel B: Logistic Regression Results	(2) 4-year graduation	(3) immediate college	(4) four-year college
Post x Treated	1.596**	0.965	0.696*
	(0.312)	(0.160)	(0.141)
Constant	4.583***	1.948***	0.567***
	(0.896)	(0.204)	(0.080)
Observations	5,572	8,068	9,581

Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1. Estimates were obtained using DiD model (1), using weights generated from the Stata -synth- command. Sample includes students who have ever been classified as English Learners in grades K-12. Each column represents a separate regression. Column (1) reports the number of college credits earned in 12th grade. College credits from different colleges have been converted to a common scale. Ten credits are the equivalent of 2 semester-long courses or 1 year-long course. Columns (2)-(4) report binary dependent variables. Panel A reports linear probability estimates; Panel B reports odds ratios. "4-year graduation" represents having graduated from high school within 4 years of attendance. "immediate college" represents enrolling in college the fall after high school exit. "Four-year college" represents directly enrolling in a 4-year college after high school. Model includes student covariates (female, ethnicity, mother's education, father's education, special education participation, 10th grade school suspensions, and AP tests taken prior to the end of 10th grade. Model also includes high school fixed effects. Coefficients for student covariates and fixed effects are suppressed.

Table 4. Event Study of Early College Program Impact on EL Academic Outcomes

Year	(1) 12th grade college credits	(2) 4-year graduation	(3) immediate college	(4) four-year college
lead3	0.392	-0.092***	-0.086**	-0.061
	(0.465)	(0.029)	(0.037)	(0.039)
lead2	0.685	-0.005	0.010	0.012
	(0.484)	(0.030)	(0.038)	(0.040)
lead1	0.062	-0.043	-0.017	-0.001
	(0.504)	(0.031)	(0.040)	(0.042)
base (program start)	9.793***	0.013	-0.018	-0.102**
	(0.500)	(0.031)	(0.040)	(0.042)
lag1	12.080***	0.037	-0.044	-0.080
	(0.632)	(0.039)	(0.050)	(0.053)
lag2	11.647***	0.177***	0.039	-0.046
	(0.703)	(0.044)	(0.056)	(0.059)
Constant	-3.099	-0.163	-0.054	0.017
	(5.259)	(0.328)	(0.416)	(0.440)
Observations	15,090	15,090	15,090	15,090
R-squared	0.148	0.291	0.230	0.222

Standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1. Estimates were obtained using model (2). Sample includes students who have ever been classified as English Learners in grades K-12. Each column represents a separate linear or linear probability regression. “lead3” represents three years before program implementation. “base” represents the year program was implemented. “lag1” represents the first year after program implementation. Column (1) reports the number of college credits earned in 12th grade. College credits from different colleges have been converted to a common scale. Ten credits are the equivalent of 2 semester-long courses or 1 year-long course. Columns (2)-(4) report binary dependent variables. “4-year graduation” represents having graduated from high school within 4 years of attendance. “immediate college” represents enrolling in college the fall after high school exit. “Four-year college” represents directly enrolling in a 4-year college after high school. Model includes student covariates (female, ethnicity, home language, mother’s education, father’s education, special education participation, 10th grade school suspensions, and AP tests taken prior to the end of 10th grade.

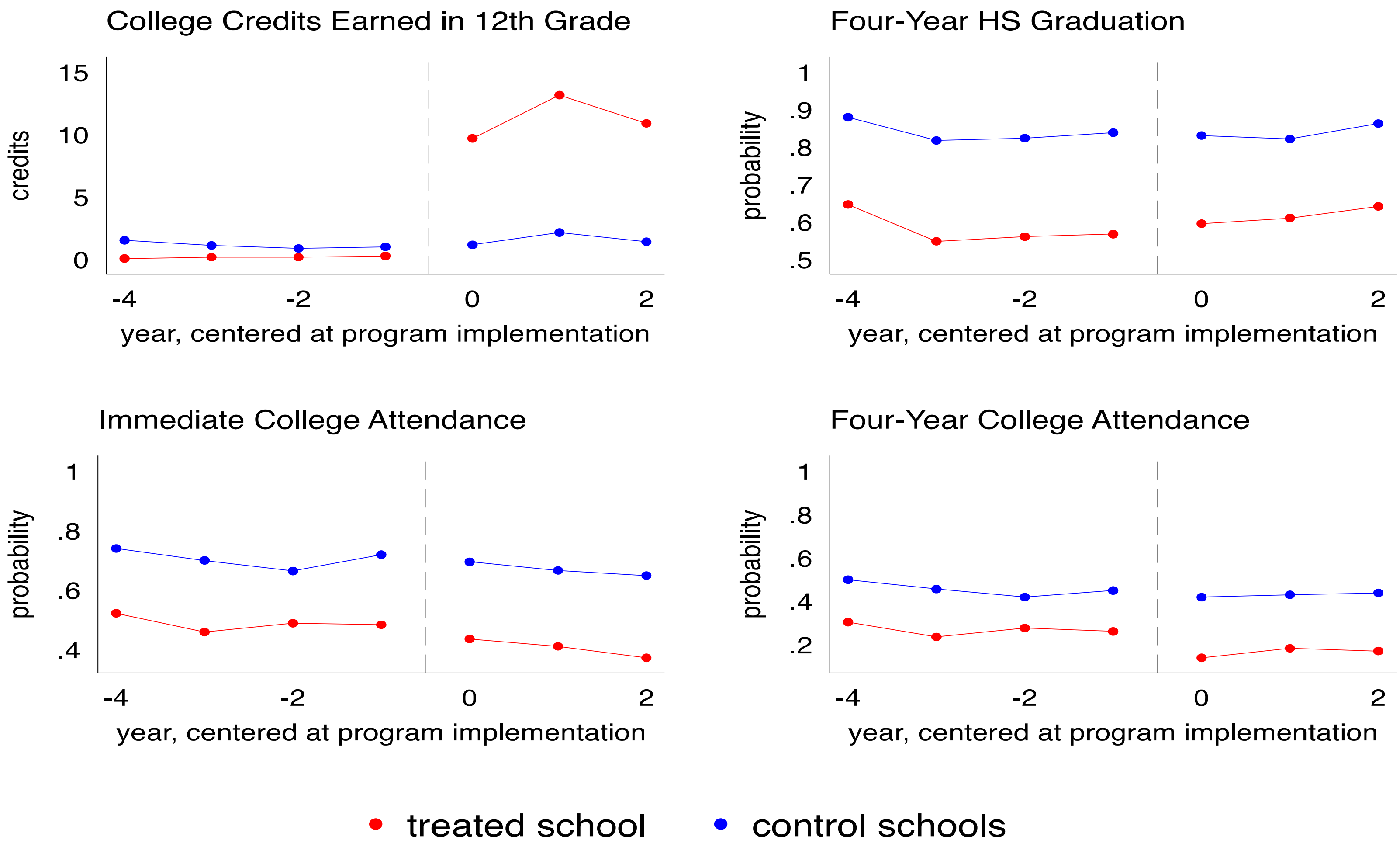
Table 5. DDD Estimates of Early College Program Impact on EL Academic Outcomes

Panel A: OLS Results	(1) 12th grade college credits	(2) 4-year graduation	(3) immediate college	(4) 4-year college
EL X Post X Treated	0.767	0.009	-0.017	-0.095*
	(0.596)	(0.042)	(0.052)	(0.054)
Constant	0.588***	0.809***	0.644***	0.363***
	(0.128)	(0.009)	(0.011)	(0.012)
Observations	26,311	26,311	26,311	26,311
R-squared	0.129	0.245	0.195	0.214

Panel B: Logistic Regression Results	(2) 4-year graduation	(3) immediate college	(4) four-year college
EL X Post X Treated	0.966	0.828	0.541*
	(0.270)	(0.217)	(0.188)
Constant	5.700***	1.970***	0.588***
	(0.499)	(0.123)	(0.034)
Observations	26,311	26,311	26,311

Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1. Estimates were obtained using a DDD model. Sample includes students with non-missing data in high school graduation cohorts 2013 to 2019. Each column represents a separate regression. Column (1) reports the number of college credits earned in 12th grade. College credits from different colleges have been converted to a common scale. Ten credits are the equivalent of 2 semester-long courses or 1 year-long course. Columns (2)-(4) report binary dependent variables. Panel A reports linear probability estimates; Panel B reports odds ratios. “4-year graduation” represents having graduated from high school within 4 years of attendance. “immediate college” represents enrolling in college the fall after high school exit. “Four-year college” represents directly enrolling in a 4-year college after high school. Model includes student covariates (female, ethnicity, home language, mother’s education, father’s education, special education participation, 10th grade school suspensions, and AP tests taken prior to the end of 10th grade.

Figure 1. Unconditional Outcome Trends for Treated and Control High Schools



Appendix Tables and Figures

Table A1. Event Study of Early College Program Impact on ELs in Smaller High Schools (A)

Year	(1) 12th grade college credits	(2) 4-year graduation	(3) immediate college	(4) four-year college
lead3	-0.121	-0.133***	-0.133***	-0.090**
	(0.572)	(0.041)	(0.045)	(0.037)
lead2	0.317	-0.079*	-0.050	-0.025
	(0.615)	(0.045)	(0.048)	(0.039)
lead1	-1.998***	-0.131***	-0.069	-0.026
	(0.674)	(0.049)	(0.052)	(0.043)
base (program start)	8.809***	-0.094*	-0.078	-0.098**
	(0.696)	(0.050)	(0.054)	(0.045)
lag1	8.767***	-0.076	-0.083	-0.061
	(0.859)	(0.062)	(0.067)	(0.055)
lag2	10.689***	0.033	-0.071	-0.022
	(1.006)	(0.073)	(0.078)	(0.064)
Constant	-0.464	0.395***	0.272**	0.266**
	(1.623)	(0.117)	(0.126)	(0.104)
Observations	2,605	2,605	2,605	2,605
R-squared	0.353	0.270	0.196	0.252

Standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1. Estimates were obtained using model (2). Sample includes students who have ever been classified as English Learners in grades K-12 and enrolled in a high school that had fewer than a total of 1000 students across cohorts 2013-2019. Each column represents a separate linear or linear probability regression. "lead3" represents three years before program implementation. "base" represents the year program was implemented. "lag1" represents the first year after program implementation. Column (1) reports the number of college credits earned in 12^{th} grade. College credits from different colleges have been converted to a common scale. Ten credits are the equivalent of 2 semester-long courses or 1 year-long course. Columns (2)-(4) report binary dependent variables. "4-year graduation" represents having graduated from high school within 4 years of attendance. "immediate college" represents enrolling in college the fall after high school exit. "Four-year college" represents directly enrolling in a 4-year college after high school. Model includes student covariates (female, ethnicity, home language, mother's education, father's education, special education participation, 10th grade school suspensions, and AP tests taken prior to the end of 10^{th} grade.

Table A2. Event Study of Early College Program Impact on ELs in Smaller High Schools (B)

Year	(1) 12th grade college credits	(2) 4-year graduation	(3) immediate college	(4) four-year college
lead3	-0.071	-0.130***	-0.125***	-0.084**
	(0.594)	(0.038)	(0.042)	(0.037)
lead2	0.127	-0.072*	-0.047	-0.014
	(0.632)	(0.041)	(0.045)	(0.040)
lead1	-2.035***	-0.116***	-0.061	-0.027
	(0.682)	(0.044)	(0.049)	(0.043)
base (program start)	8.481***	-0.072	-0.073	-0.116***
	(0.698)	(0.045)	(0.050)	(0.044)
lag1	8.829***	-0.051	-0.085	-0.085
	(0.866)	(0.056)	(0.062)	(0.054)
lag2	10.542***	0.071	-0.060	-0.057
	(1.005)	(0.065)	(0.072)	(0.063)
Constant	-4.932	0.341	0.459	0.573*
	(4.751)	(0.307)	(0.338)	(0.298)
Observations	3,177	3,177	3,177	3,177
R-squared	0.292	0.292	0.232	0.283

Standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1. Estimates were obtained using model (2). Sample includes students who have ever been classified as English Learners in grades K-12 and enrolled in a high school that had fewer than a total of 700 EL students across cohorts 2013-2019. Each column represents a separate linear or linear probability regression. "lead3" represents three years before program implementation. "base" represents the year program was implemented. "lag1" represents the first year after program implementation. Column (1) reports the number of college credits earned in 12th grade. College credits from different colleges have been converted to a common scale. Ten credits are the equivalent of 2 semester-long courses or 1 year-long course. Columns (2)-(4) report binary dependent variables. "4-year graduation" represents having graduated from high school within 4 years of attendance. "immediate college" represents enrolling in college the fall after high school exit. "Four-year college" represents directly enrolling in a 4-year college after high school. Model includes student covariates (female, ethnicity, home language, mother's education, father's education, special education participation, 10th grade school suspensions, and AP tests taken prior to the end of 10th grade.

Table A3. Event Study of Early College Program Impact on non-EL Academic Outcomes

Year	(1) 12th grade college credits	(2) 4-year graduation	(3) immediate college	(4) four-year college
lead3	-0.114	0.006	0.024	0.048
	(0.644)	(0.052)	(0.064)	(0.064)
lead2	-0.295	-0.019	0.030	0.044
	(0.621)	(0.051)	(0.062)	(0.061)
lead1	-0.333	-0.143***	-0.050	0.024
	(0.568)	(0.046)	(0.057)	(0.056)
base (program start)	10.708***	-0.019	-0.091	-0.011
	(0.620)	(0.050)	(0.062)	(0.061)
lag1	8.390***	0.130**	0.139*	0.116
	(0.715)	(0.058)	(0.071)	(0.071)
lag2	0.328*	0.630***	0.541***	0.366***
	(0.199)	(0.016)	(0.020)	(0.020)
Constant				
	11,221	11,221	11,221	11,221
	0.113	0.254	0.219	0.265
Observations	-0.114	0.006	0.024	0.048
R-squared	(0.644)	(0.052)	(0.064)	(0.064)

Standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1. Estimates were obtained using model (2). Sample includes students who have never been classified as English Learners in grades K-12. Each column represents a separate linear or linear probability regression. “lead3” represents three years before program implementation. “base” represents the year program was implemented. “lag1” represents the first year after program implementation. Column (1) reports the number of college credits earned in 12^{th} grade. College credits from different colleges have been converted to a common scale. Ten credits are the equivalent of 2 semester-long courses or 1 year-long course. Columns (2)-(4) report binary dependent variables. “4-year graduation” represents having graduated from high school within 4 years of attendance. “immediate college” represents enrolling in college the fall after high school exit. “Four-year college” represents directly enrolling in a 4-year college after high school. Model includes student covariates (female, ethnicity, home language, mother’s education, father’s education, special education participation, 10th grade school suspensions, and AP tests taken prior to the end of 10^{th} grade.

Table A4. DiD Estimates of Early College Program Impact on Non-EL Academic Outcomes

Panel A: OLS Results	(1) 12th grade college credits	(2) 4-year graduation	(3) immediate college	(4) 4-year college
Post x Treated	9.987***	0.065	-0.018	0.002
	(1.212)	(0.050)	(0.048)	(0.037)
Post	0.526***	0.001	-0.035***	-0.027***
	(0.080)	(0.007)	(0.009)	(0.009)
Treated	-0.610***	0.305***	0.139***	0.043*
	(0.219)	(0.047)	(0.042)	(0.024)
Constant	0.482	0.309***	0.220***	0.208***
	(0.774)	(0.061)	(0.073)	(0.064)
Observations	11,221	11,221	11,221	11,221
R-squared	0.111	0.251	0.214	0.263
Pre-program difference	-0.610	0.305	0.139	0.043
Post-program difference	9.377	0.370	0.120	0.045

Panel B: Logistic Regression Results	(2) 4-year graduation	(3) immediate college	(4) four-year college
Post x Treated	1.428	0.987	0.906
	(0.340)	(0.221)	(0.292)
Constant	3.400***	1.574***	0.375***
	(0.359)	(0.125)	(0.030)
Observations	11,221	11,221	11,221

Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1. Estimates were obtained using DiD model (1). Sample includes students who have never been classified as English Learners in grades K-12. Each column represents a separate regression. Column (1) reports the number of college credits earned in 12th grade. College credits from different colleges have been converted to a common scale. Ten credits are the equivalent of 2 semester-long courses or 1 year-long course. Columns (2)-(4) report binary dependent variables. Panel A reports linear probability estimates; Panel B reports odds ratios. "4-year graduation" represents having graduated from high school within 4 years of attendance. "immediate college" represents enrolling in college the fall after high school exit. "Four-year college" represents directly enrolling in a 4-year college after high school. Model includes student covariates (female, ethnicity, mother's education, father's education, special education participation, 10th grade school suspensions, and AP tests taken prior to the end of 10th grade. Model also includes high school fixed effects. Coefficients for student covariates and fixed effects are suppressed.

Figure A1. Outcome Trends for Treated and Synthetic High Schools

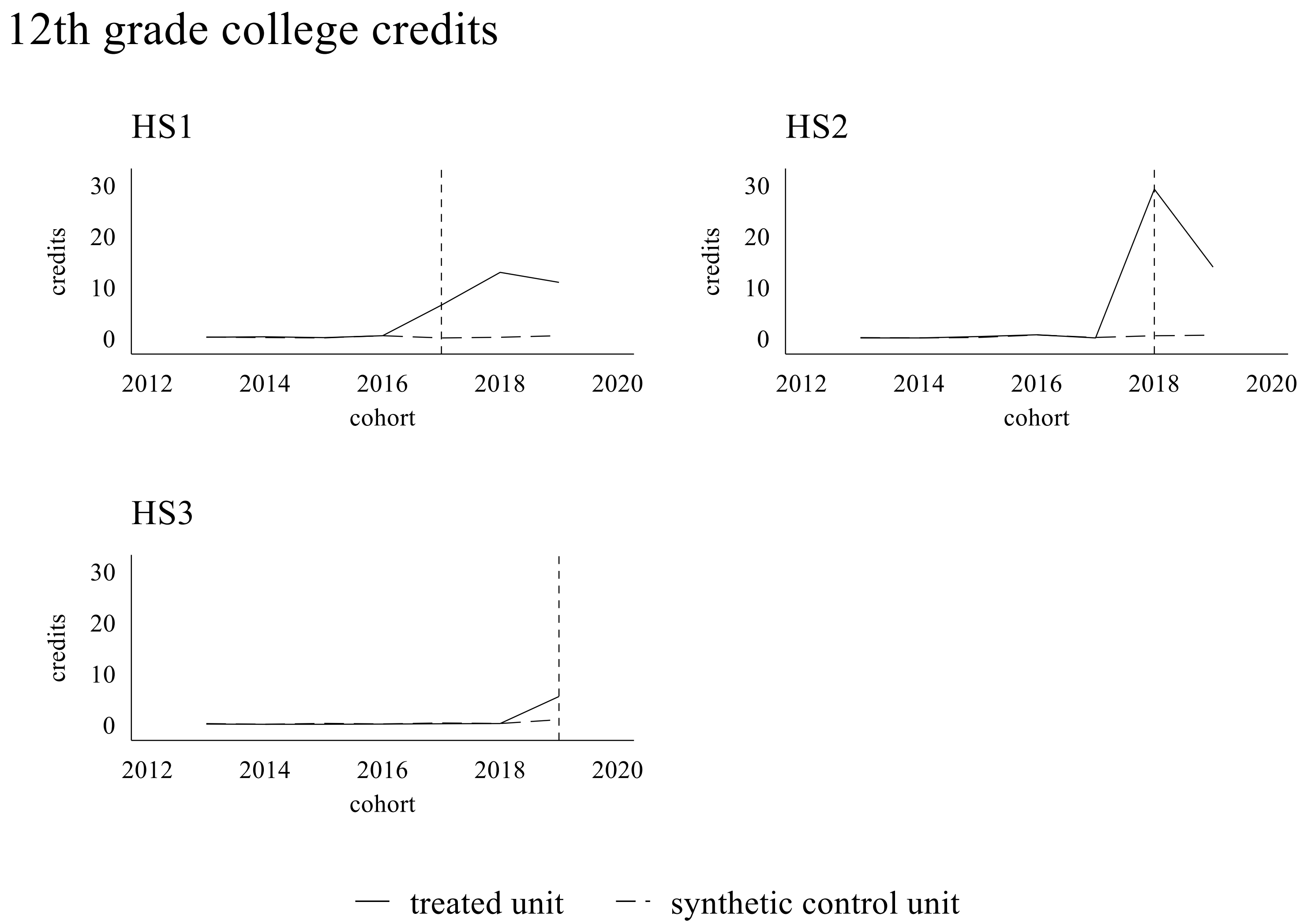


Figure A1. Outcome Trends for Treated and Synthetic High Schools (continued)

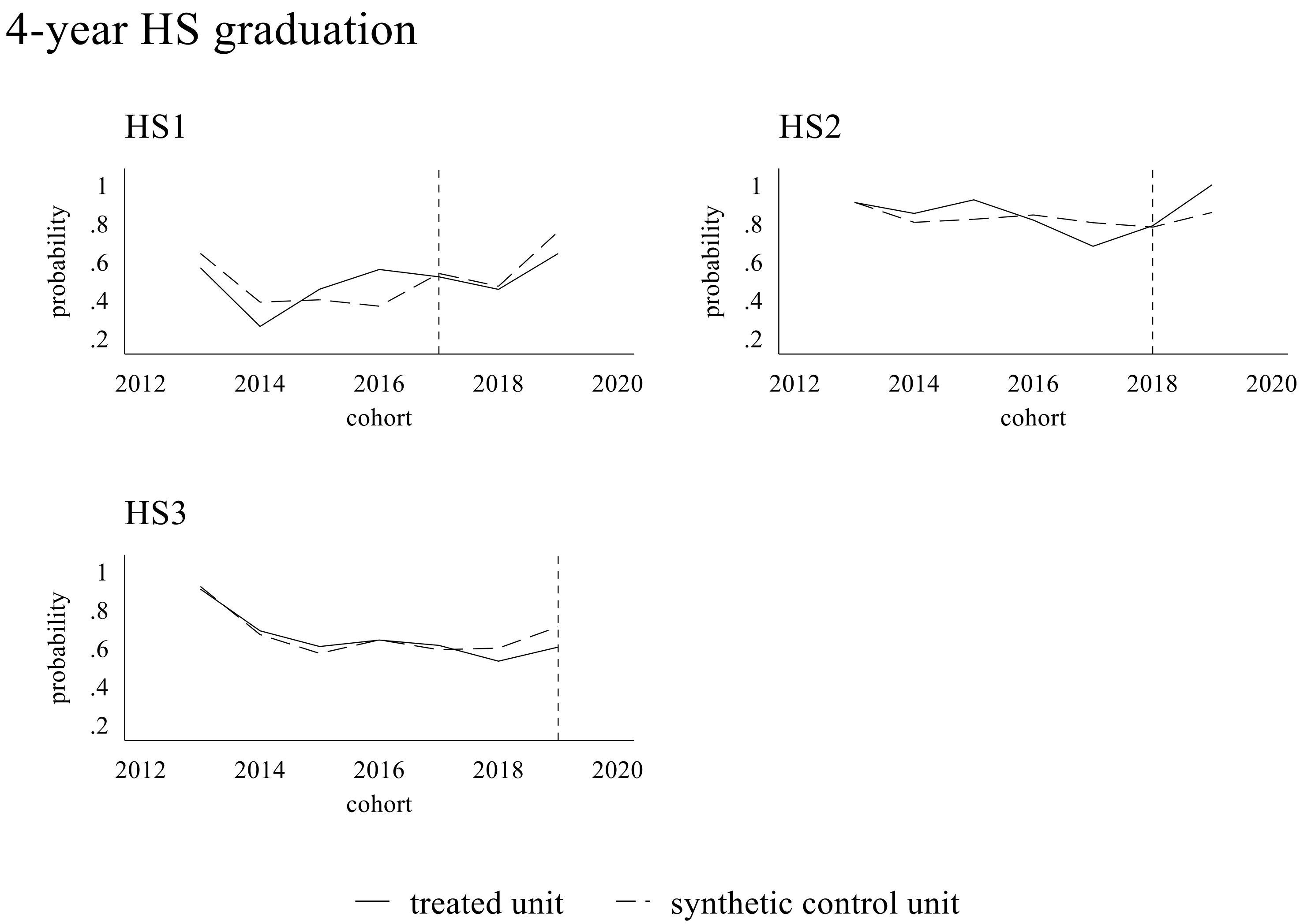


Figure A1. Outcome Trends for Treated and Synthetic High Schools (continued)

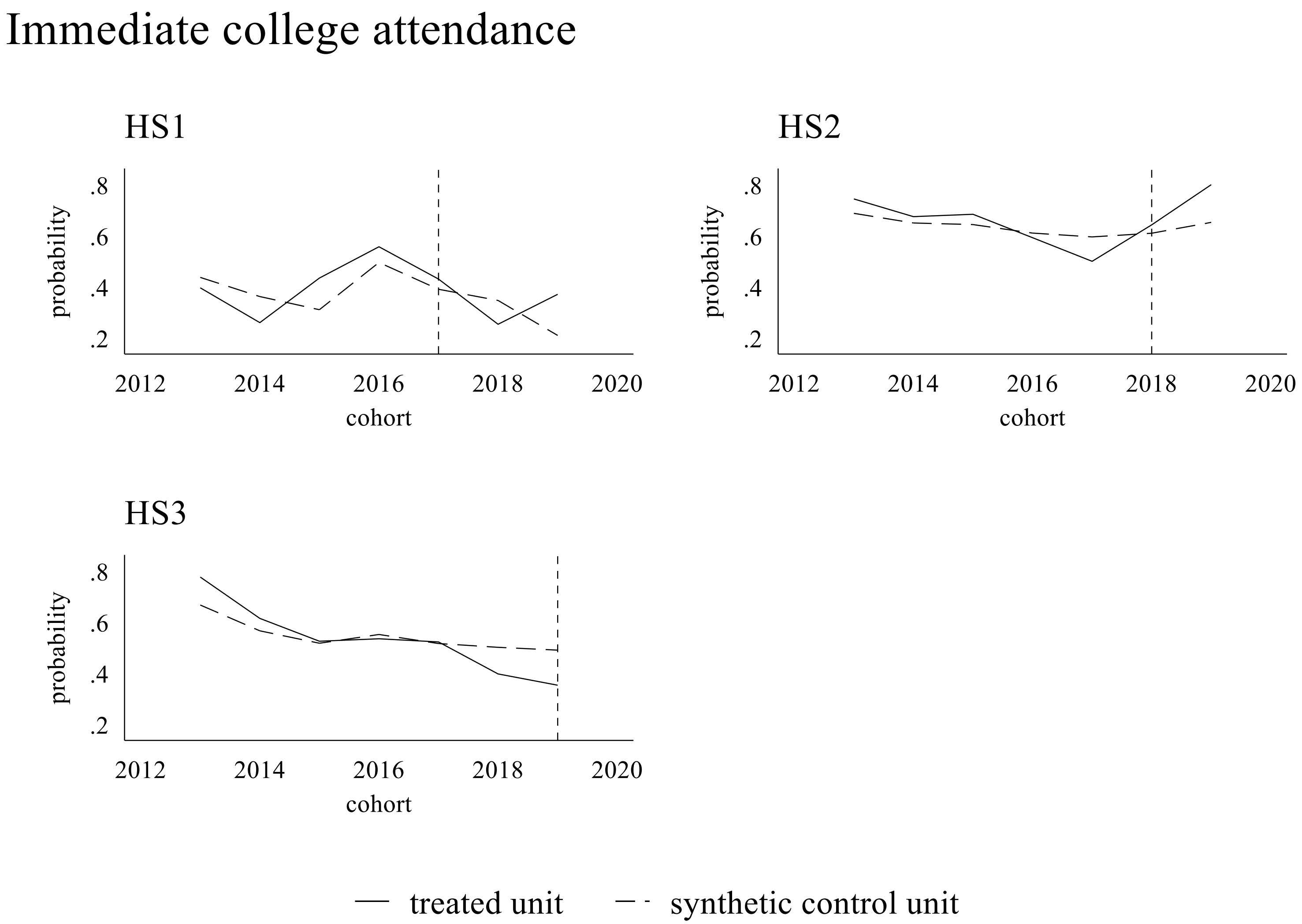


Figure A1. Outcome Trends for Treated and Synthetic High Schools (continued)