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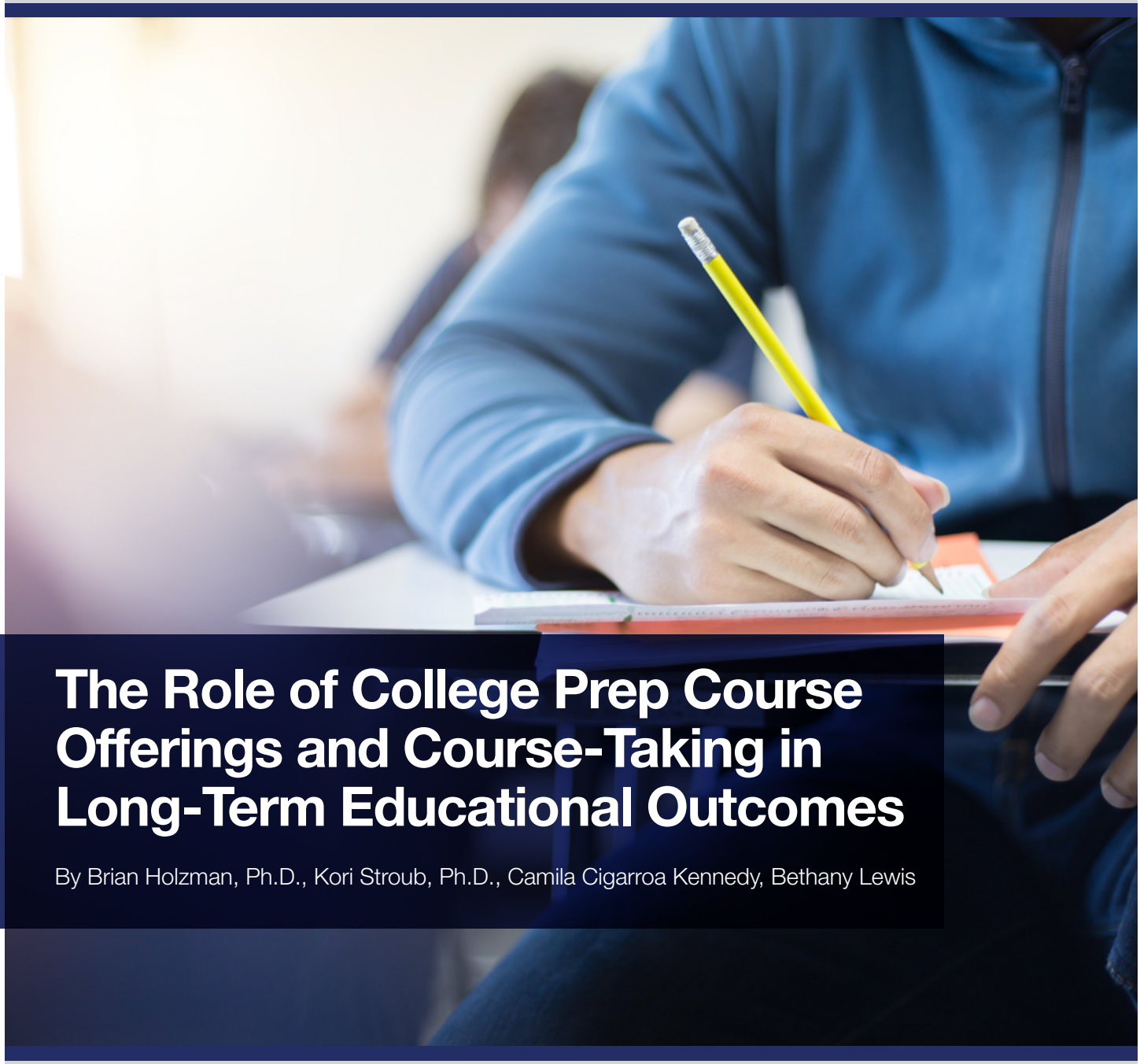

# The Role of College Prep Course Offerings and Course-Taking in Long-Term Educational Outcomes

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**Research Brief**
for the Houston Independent School District

Volume No. 8, Issue No. 2. | August, 2019

## About HERC

The Houston Education Research Consortium (HERC) is a partnership between Rice University and several Houston-area school districts. Through this partnership, HERC aims to improve the connection between education researchers and decision makers for the purpose of closing the socioeconomic gaps in educational achievement and attainment for students.

**Suggested Citation**

Holzman, B., Stroub, K., & Kennedy, C. C., & Lewis, B. (2019). *The Role of College Prep Course Offerings and Course-Taking in Long-Term Educational Outcomes.* Houston, TX: Houston Education Research Consortium, Kinder Institute for Urban Research, Rice University.

# Summary

In this brief, we describe the distribution of college prep course offerings across Texas and determine which school characteristics are associated with higher and lower numbers of course offerings. We also examine how college prep course offerings are related to student-level college prep course-taking and, in turn, how course-taking behaviors are related to long-term educational outcomes. This investigation of the distribution of college prep course offerings across Texas high schools reveals that more college prep courses are offered at larger, urban and suburban schools with higher levels of academic achievement and lower levels of economic disadvantage. Offering more college prep courses is associated with higher levels of course-taking, which, in turn, is associated with improved chances of completing a postsecondary credential, particularly for lower-achieving students.

## Key Findings

- **Schools that offered more college prep courses were larger, urban or suburban, and had more higher-achieving students and fewer economically disadvantaged students.**
- **Offering more college prep courses increased college prep course-taking, but only slightly.**
- **Taking more college prep courses increased postsecondary attainment.** Each additional college prep course increased postsecondary credential completion by 0–1 percentage points and bachelor's degree completion by 1–2 percentage points.
- **The role of college prep course offerings on course-taking varied by student achievement level.** When more college prep courses were offered, higher-achieving students enrolled in more college prep courses, but the lowest-achieving students did not.
- **The role of college prep course-taking on postsecondary outcomes varied by student achievement level.** Lower-achieving students appeared to benefit the most from taking additional college prep courses. Their likelihood of completing a postsecondary credential increased as they took more college prep courses, and at very high levels of course-taking, they appeared to catch up to their higher-achieving peers.

# The Role of College Prep Course Offerings and Course-Taking in Long-Term Educational Outcomes

## Introduction

According to a recent longitudinal analysis that tracked eighth grade students in the 1998–1999 school year through the 2014–2015 school year, only 29 percent of public school students in Texas completed a postsecondary credential within 12 years of high school graduation (Kinder Institute for Urban Research, 2018). Concerned with this low rate of postsecondary completion, the Texas Higher Education Coordinating Board set a new goal called *60x30TX*, which aims to increase the share of 25- to 34-year-olds with a certificate or degree to 60 percent by 2030 (2015).[1] The state also revised its school accountability system to integrate measures of college, career, and military readiness like earning high scores on Advanced Placement (AP) and International Baccalaureate (IB) exams, completing dual course credits, and enlisting in the military (Texas Education Agency, 2018).

The state's increasing focus on college prep coursework[2] may help it achieve the *60x30TX* goal 1) if college prep courses are widely available to schools and students and 2) if college prep courses demonstrate positive impacts on long-term educational outcomes. Previous research has shown, however, that the opportunities to take these courses are not evenly distributed across public schools. Schools with higher levels of achievement are more likely to offer AP and IB courses than schools with lower levels of achievement (Iatarola, Conger, & Long, 2011) and poor students are less likely to take AP and IB courses than non-poor students (Conger, Long, & Iatarola, 2009). Despite these disparities, college prep coursework increases two- and four-year college enrollment (Long, Conger, & Iatarola, 2012) and, for those who earn college credit through their AP exam scores, college prep coursework is associated with higher rates of bachelor's degree completion and reduced time to degree (Evans, 2018).

## Purpose of the Study

Increasing access to college prep coursework and encouraging more students to complete these courses may prepare students for the rigors of a postsecondary education and contribute to their success. Building on prior research (Holzman, 2018; Kinder Institute for Urban Research, 2018; National Center for Higher Education Management Systems, 2012), we used administrative data from Texas public schools to ask the following:

1. Which types of high schools offer more college prep courses?
2. Do students take more college prep courses in schools that offer more of them?
3. Is taking more college prep courses associated with more postsecondary attainment?
4. How does the role of college prep course offerings and course-taking differ by student achievement?

To address these questions, we tracked a single cohort of eighth grade students during the 1998–1999 school year through four years of high school and for 12 years thereafter. Details on the data, sample, and analytic strategy are available in Appendix B.

1 It is important to note that the Kinder Institute analysis tracked a single cohort of eighth grade students in public schools. However, the *60x30TX* goal was based on an age range, not a single cohort. These are distinct populations and differences between the Kinder Institute analysis and the *60x30TX* goal must be interpreted with caution.

2 We define college prep courses as AP, IB, or other advanced courses as outlined by the Academic Excellence Indicator System (Texas Education Agency, 2001).

# Findings

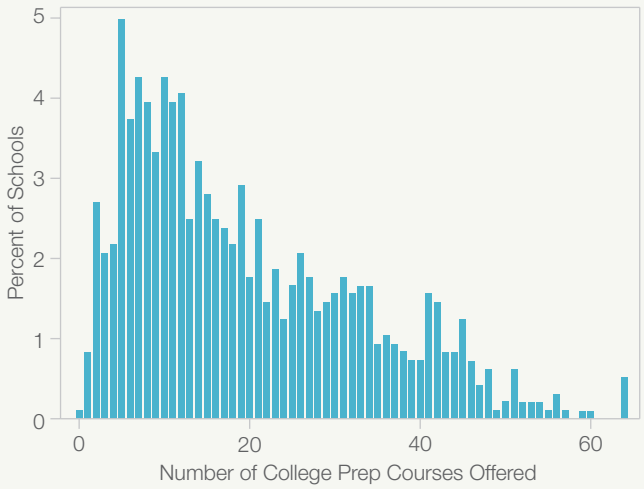
### Research Question #1: Which types of high schools offer more college prep courses?

First, we determined whether the number of unique college prep courses offered at a high school was associated with other school-level characteristics. Before presenting the results, it is useful to understand the variation in course offerings across Texas public schools. Panel A in Figure 1 shows that during the 2002–2003 school year, the number of unique college prep course offerings ranged from 0 to 64. Most schools offered between 0 and 20 college prep courses, and few schools offered more than 40 courses. Panel B illustrates the spatial distribution of college prep course offerings in the state's school districts. Darker shades of brown denote higher numbers of unique course offerings, while lighter shades of brown denote fewer course offerings. As one might expect, districts with the most course offerings tended to be located in major metropolitan areas, whereas districts with fewer course offerings lay in rural areas.

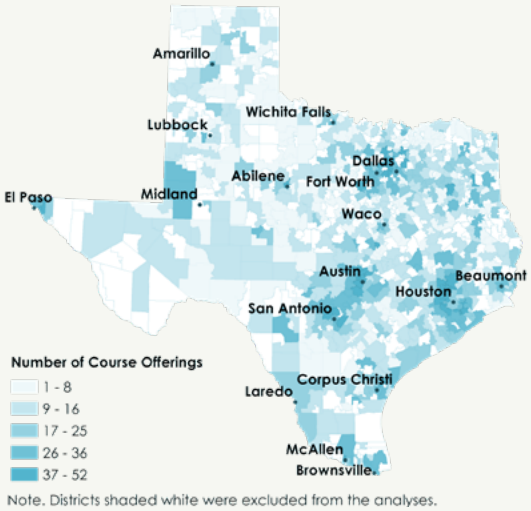
Next, we found that, net of other factors, schools with higher percentages of economically disadvantaged students offered fewer numbers of unique college prep courses (*see Table 1 for regression results*). For each 10 percentage point increase in the share of economically disadvantaged students, 1.31 fewer courses were offered. Interestingly, net of other factors, schools with higher percentages of underrepresented minority students (URM; includes black, Hispanic, and Native American students) offered more college prep courses. For each 10 percentage point increase in URM students, 1.01 additional courses were offered. Schools in rural areas offered 1.46 fewer unique college prep courses than schools in suburban and urban areas. In addition, larger schools offered more college prep courses than smaller schools; an additional 100 students enrolled translated to 1.17 more courses offered. Finally, academic achievement was related to college prep course offerings. A 100-point increase in a school's average SAT score was associated with 2.29 additional courses offered.

**Figure 1. College Prep Course Offerings in Texas, 2002–2003**

*Panel A. Histogram of College Prep Offerings*




*Panel B. Average Number of College Prep Course Offerings, by District*




Note. Districts shaded white were excluded from the analyses.

**Table 1. Linear Regression Model Predicting School-Level College Prep Course Offerings**

| Variables | Coef. | Sig. |
|---|---|---|
| Pct. URM (in 10s) | 1.01 | *** |
| Pct. Economic Disadvantage (in 10s) | –1.31 | *** |
| Avg. SAT Score (in 100s) | 2.29 | *** |
| Size (in 100s) | 1.17 | *** |
| Rural | –1.46 | *** |
| Intercept | –12.60 | *** |
| $R^2$ | 0.78 | |

*Notes*: Sample includes 962 schools. Robust standard errors are in parentheses. Please refer to Appendix A for variable descriptions.

* p<0.10, ** p<0.05, *** p<0.01 (two-tailed tests)

### Research Question #2: Do students take more college prep courses in schools that offer more of them?

Building on the findings that college prep course offerings were related to other school characteristics like the socio-demographic composition of the student body and its level of academic achievement, we sought to determine whether course offerings predicted student-level course-taking patterns. Panel A in Figure 2 shows that although some students took upwards of 16 college prep courses during high school, approximately one-third of students took none. Panel B illustrates the spatial distribution of college prep course-taking in school districts across the state of Texas. Districts shaded in dark brown had higher levels of course-taking, while districts shaded in light brown had lower levels of course-taking. Similar to the spatial distribution of college prep course offerings, the map shows that school districts with higher average numbers of college prep courses taken were located in major metropolitan areas, while districts with the lowest average number of courses taken were located in rural areas.

Through a multivariate analysis that accounted for a variety of student and school characteristics, we found that each additional college prep course offered increased the number of college prep courses taken by a student by **0.06**.[3] To put this in perspective, for the average student to take an additional college prep course, a school must offer roughly 17 additional courses. Although this relationship was statistically significant, it was very small, especially since it would be challenging for schools to increase the number of college prep courses they offered so dramatically in a short period of time and without substantial financial and human capital investments.

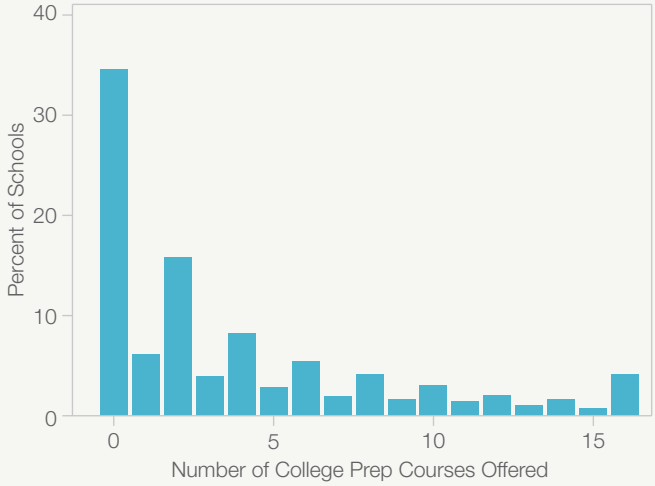
### Research Question #3: Is taking more college prep courses associated with more postsecondary attainment?

The results showed that taking more college prep courses increased the likelihood of postsecondary degree completion. Net of other factors, an additional college prep course taken during high school increased the likelihood of completing any postsecondary credential by **0–1** percentage points and the likelihood of completing a bachelor's degree by **1–2** percentage points. Given the low

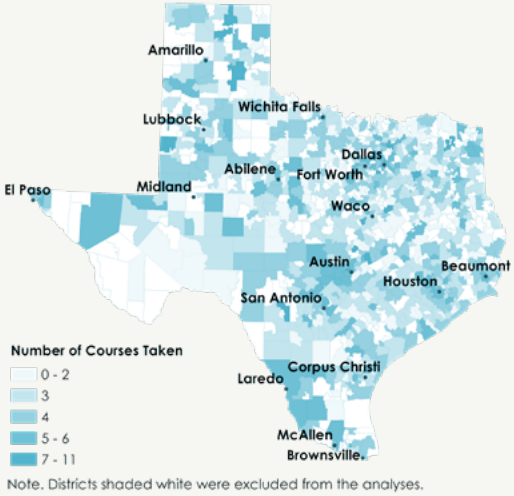
3 Regression results are available in Appendix C.

**Figure 2. College Prep Course-Taking in Texas, 2000–2003**

*Panel A. Histogram of College Prep Courses Taken*



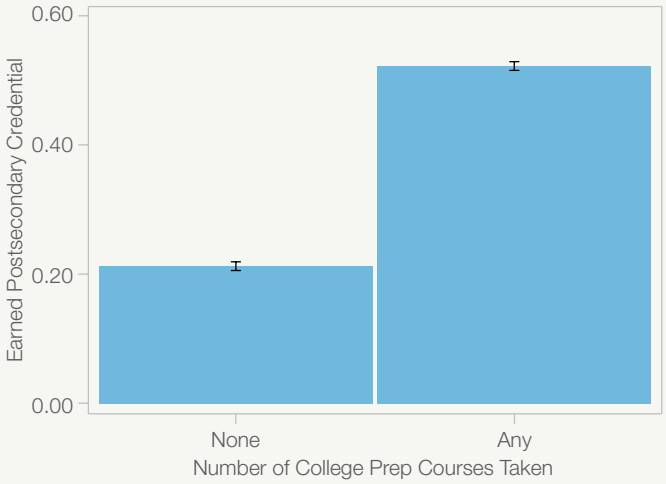

*Panel B. Average Number of College Prep Courses Taken, by District*




Note. Districts shaded white were excluded from the analyses.

**Figure 3. Relationship between Any College Prep Course-Taking and Postsecondary Attainment**

*Panel A. Earned Postsecondary Credential*




*Panel B. Earned Bachelor's Degree*

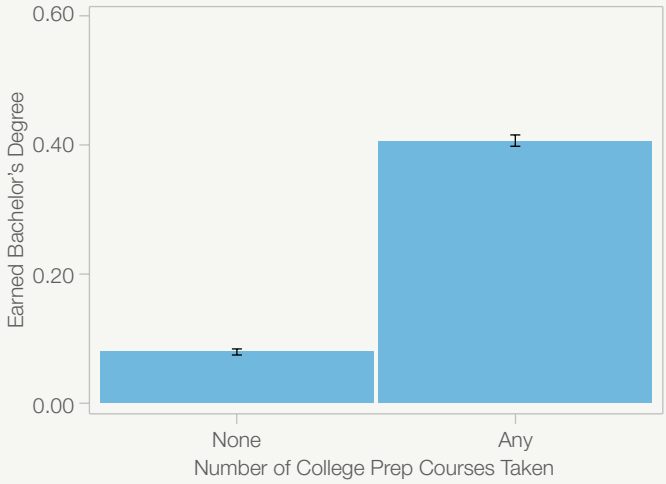
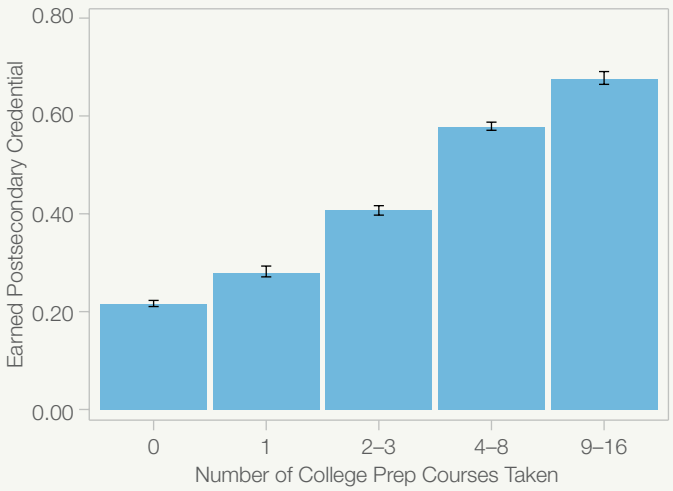
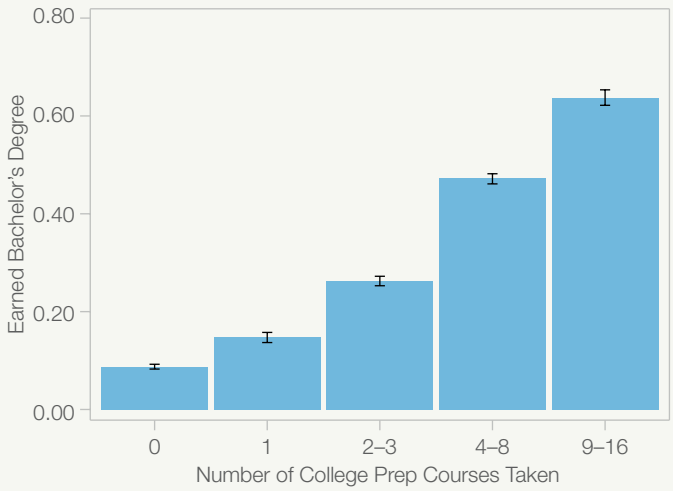



**Figure 4. Relationship between College Prep Course-Taking in Bins and Postsecondary Attainment**

*Panel A. Earned Postsecondary Credential*




*Panel B. Earned Bachelor's Degree*




levels of postsecondary attainment in Texas, these results were substantial.

We also examined the relationship between college prep course-taking and postsecondary degree completion in Harris County and the Houston Independent School District. Since the findings were nearly identical, we do not discuss them here. Instead, these results are available in Appendices E and F.

In additional analyses, we tested different definitions of college prep course-taking. First, we compared the postsecondary outcomes of students who took no college prep courses to students who took any (1 or more). The graphs in Figure 3 show that 52 percent of students who took at least one college prep course earned a postsecondary credential. In contrast, only 21 percent of students who did not take any college prep coursework earned a credential. There were also large gaps in bachelor's degree completion by college prep course-taking: 41 percent of students who took any courses earned a B.A., while only 8 percent of students who took no courses did so.

Next, we categorized students into five groups based on the number of college prep courses they took: 0 courses, 1 course, 2–3 courses, 4–8 courses, and 9–16 courses.[4] This categorization allowed us to test whether there were ben-

4 These categories corresponded to quintiles: approximately one-fifth of the sample fell into each category.

efits to taking higher numbers of college prep courses versus taking just one. The graphs in Figure 4 show a clear pattern: students who took higher numbers of college prep courses were more likely to earn a postsecondary credential or bachelor's degree. For example, compared to students who took no college prep courses (22% completion rate), students who took 2–3 courses (41% completion rate) were almost twice as likely to complete any postsecondary credential, and students who took 9–16 courses (68% completion rate) were more than three times as likely to do so. There was a similar pattern for bachelor's degree completion. Compared to students who took no college prep courses (9% completion rate), students who took 2–3 courses (26% completion rate) were three times as likely to complete a bachelor's degree, and students who took 9–16 courses (64% completion rate) were nearly eight times as likely to complete a bachelor's degree. Clearly, taking college prep courses, and more of them, was highly associated with postsecondary attainment.

### Research Question #4: How does the role of college prep course offerings and course-taking differ by student achievement?

Finally, we addressed how college prep course offerings and course-taking demonstrated differential associations by academic achievement. As schools are held accountable for the courses that students take, they may consider broadening access to college prep coursework to students of varying achievement levels. Therefore, it is important to understand whether increasing the number of courses offered and the number of courses taken matters more or less for students with higher or lower test scores. It is possible that offering additional college prep courses or encouraging students to take more of them can help lower-achieving students and close gaps in postsecondary attainment between lower- and higher-achievers.

First, we tested whether the relationship between the number of unique college prep course offerings and course-taking showed differential associations by students' average scores on their eighth grade Texas Assessment of Academic Skills (TAAS). We show the associations for five levels of academic achievement, which range from -2 standard deviations below the state mean (the lowest-achieving students) to +2 standard deviations above the state mean (the highest-achieving students). Students in the 0 SD group should be thought of as average-achieving students. Figure 5 demonstrates that as the number of courses offered at a school increased, students with higher test scores took more college prep courses. In contrast, students with the lowest test scores enrolled in roughly the same number of college prep courses, regardless of the course offerings. This makes sense if test scores are a barrier to entry into these courses (e.g., schools use them or other measures of achievement in the course recommendation and assignment process).

Next, we examined whether college prep course-taking had differential associations with postsecondary attain-

**Figure 5. Relationship between Student-Level College Prep Course-Taking and School-Level College Prep Course Offerings by 8th Grade Composite Test Scores**

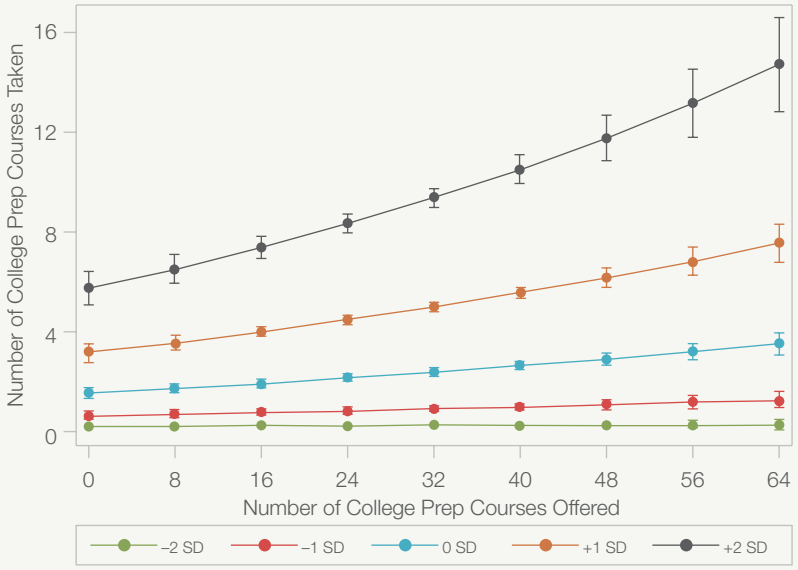
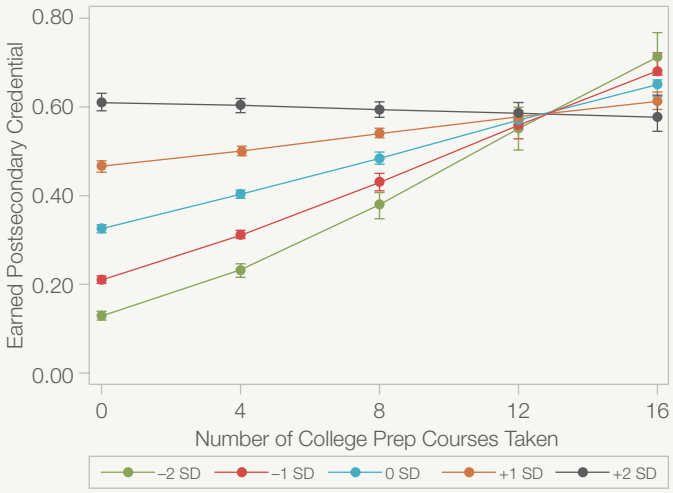
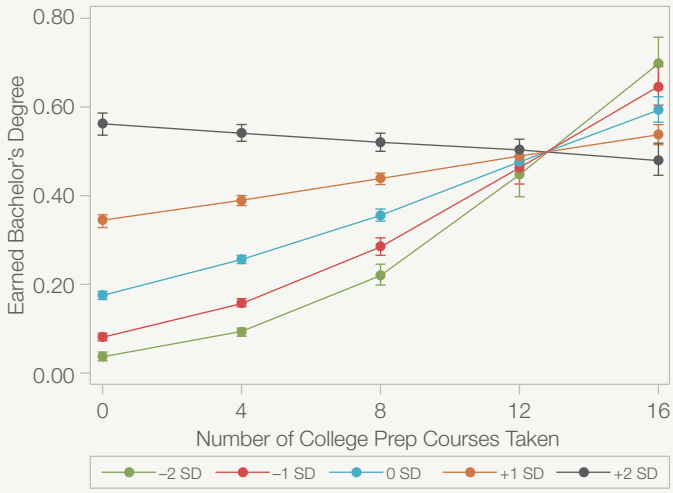


**Figure 6. Relationship between Postsecondary Attainment and Student-Level College Prep Course-Taking by 8th Grade Composite Test Scores**

*Panel A. Earned Postsecondary Credential*




*Panel B. Earned Bachelor's Degree*




ment for students with higher and lower test scores. The graphs in Figure 6 show this to be the case. In both graphs, college prep course-taking did not appear to have much influence on the highest-achieving students' probability of earning a degree; regardless of the number of courses that they took, they were more than likely to complete college. In contrast, college prep course-taking had disproportionate associations for lower-achieving students; their exposure to these rigorous courses had large relationships with their likelihood of college completion. In fact, at very high levels of college prep course-taking, low-achieving students appeared to catch up to their higher-achieving peers.

# Conclusion

Our findings suggest that, in Texas, higher numbers of college prep courses tend to be offered in larger, urban and suburban schools, in schools with higher average SAT scores, and in schools with lower concentrations of economically disadvantaged students. Despite these patterns, in general, offering more college prep courses is associated with higher levels of college prep course-taking. The relationship is rather small, however, and implies that a school must dramatically increase its course offerings to have a meaningful influence on students.

Students who take additional college prep courses are more likely to earn any postsecondary credential and a bachelor's degree. While higher-achieving students enroll in more college prep courses when there are more courses offered, they benefit the least from taking additional courses. On the other hand, among lower-achieving students, increasing course offerings does not translate into course-taking, suggesting that there are barriers to entry, such as within-school curriculum tracking. Nevertheless, lower-achieving students appear to benefit the most from taking higher numbers of college prep courses.

As states integrate higher educational outcomes into their accountability systems, schools and districts may seek new strategies to prepare all students, regardless of their test scores, for the college curriculum. If college prep courses are thought to have causal impacts on degree attainment, then reducing the barriers to entry and allowing students of varying achievement levels to enroll may help stakeholders achieve their goals. College prep courses may be a strategy to broaden college access and success to all students, regardless of their achievement, and close gaps between groups.

# Recommendations

It may not be cost effective for schools to dramatically increase their college prep course offerings with the goal of increasing course-taking. Based on our analysis of college prep course-taking, it would take 17 additional courses offered for a student to take one additional course. Increasing the number of college prep course offerings in such a substantial way may not be practical for many schools to implement, especially if it involves hiring new or different types of teachers or providing them with additional professional development. While a cost-benefit analysis is beyond the scope of this study, **there may be other, more effective means to increase college prep course-taking that do not involve expanding course offerings.** Furthermore, **schools should consider encouraging students to take more of the college prep courses already offered and gradually increase course offerings as more students enroll in them.**

Based on our analysis of postsecondary attainment, **students, particularly those who are lower-achieving, should be encouraged to enroll in college prep courses and more of them.** Taking any college prep courses is positively associated with postsecondary credential completion, and the likelihood of completion increases as students take more courses. Moreover, since college prep courses appear to benefit lower-achieving students the most, there should be more targeted efforts to enroll them in more courses. Doing so may potentially reduce postsecondary attainment gaps by academic achievement.

Of course, we cannot assume that all students will be equally prepared for the rigor of college prep courses, let alone tackling a full schedule of college prep courses. If students are encouraged to enroll in these courses, then schools should ensure that they are introduced to pre-college prep coursework (i.e., pre-AP, pre-IB) in middle school and early on in high school. They should also identify novel instructional strategies or academic support systems to ensure that lower-achieving students taking these courses can be successful.

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# Appendix A. Variables Used in the Analyses

| Variable | Description |
|---|---|
| **Outcomes** | |
| Earned a Postsecondary Credential | Binary: Whether a student earned any postsecondary credential (certificate, associate's degree, bachelor's degree, master's degree, doctoral/professional degree) within 12 years of high school graduation (by spring 2015). |
| Earned a Bachelor's Degree | Binary: Whether a student earned a bachelor's degree or higher (bachelor's degree, master's degree, doctoral/professional degree) within 12 years of high school graduation (by spring 2015). |
| **Student Characteristics** | |
| Number of College Prep Courses Taken | Continuous: Included Advanced Placement (AP), International Baccalaureate (IB), and other advanced courses as outlined by the Academic Excellence Indicator System (AEIS). Top-coded at 16. |
| Age | Continuous: As of fall 1998. Reported in years. Bottom-coded at 12, top-coded at 15. |
| Female | Binary. |
| Race/Ethnicity | Categorical: White (ref.), Black, Hispanic, and Asian. |
| English Learner | Binary. |
| Special Education | Binary. |
| Economic Disadvantage | Binary: Eligible for the free and reduced price lunch program or other federal poverty programs or living below the federal poverty line. |
| Attendance Rate | Continuous: Percentage of school days present. Reported in 10s. Bottom-coded at 80%. |
| Composite TAAS Score | Continuous: Average of reading, mathematics, social studies, science, and writing test scores from the 8th grade Texas Assessment of Academic Skills (TAAS). Reported in standard deviation units. Bottom-coded at -2 SD, top-coded at +2 SD. |
| Number of Dual Credit Courses Taken | Continuous: Courses for which a student received high school and college credit. Excluded dual credit courses counted as advanced. Top-coded at 4. |
| Number of CTE Courses Taken | Continuous: Career and Technical Education (CTE) courses provided vocational training. Excluded CTE courses counted as dual credit. Top-coded at 16. |
| Total Number of Courses Taken | Continuous: Top-coded at 64. |
| High School Graduation Program | Categorical: Minimum (ref.), Recommended, and Distinguished. |
| College Plans | Binary: Whether a student planned to attend college. |

| Variable | Description |
|---|---|
| **School Characteristics** | |
| Number of College Prep Courses Offered | Continuous: Calculated by using student-level course-taking data and aggregating the number of unique courses to the school-level. Top-coded at 64. |
| Percentage Underrepresented Minority | Continuous: Percentage of underrepresented minority students (black, Hispanic, or Native American). From AEIS. Reported in 10s. |
| Percentage Economic Disadvantage | Continuous: Percentage of economically disadvantaged students. From AEIS. Reported in 10s. |
| Average SAT Score | Continuous: Average SAT score. Average ACT scores were converted to average SAT scores using the 1999 concordance table from the College Board. For schools with both scores available, the highest score (in SAT units) was used. From AEIS. Reported in 100s. Bottom-coded at 750, top-coded at 1,250. |
| Size | Continuous: Total number of students enrolled. From AEIS. Reported in 100s. |
| Rural | Binary: From Common Core of Data. |
| **Other** | |
| Immediate Enrollment in Any College | Binary: Whether a student enrolled in any postsecondary institution (less-than-2-year, 2-year, 4-year) after high school graduation (fall 2003). Analyses were restricted to this subsample in some models. |
| Immediate Enrollment in a Four-Year College | Binary: Whether a student enrolled in a four-year postsecondary institution after high school graduation (fall 2003). Analyses were restricted to this subsample in some models. |
| Average Number of College Prep Courses Taken | Continuous: Calculated by using student-level course-taking data and aggregating the number of college prep courses taken from the student-level to the school-level. Used as an instrumental variable in some models. |

# Appendix B. Methodology

## Data

We used administrative data for all students attending Texas public schools, which were available at the University of Houston Education Research Center. Building on prior work (Holzman, 2018; Kinder Institute for Urban Research, 2018; National Center for Higher Education Management Systems, 2012), we focused on one cohort of eighth graders during the 1998–1999 school year and followed them through high school and 12 years thereafter (through spring 2015).

## Sample

We limited the sample to students who graduated high school with their cohort (in spring 2003) and who did not switch schools. While a number of students moved schools during high school, including these students would make accounting for school characteristics difficult. More importantly, it was unclear whether mobile students switched schools for better course-taking opportunities that could help them graduate from college. Therefore, our estimates might be considered generalizable to non-mobile high school students only.

In addition, we excluded Native American students due to small sample size and students missing data on the covariates included in our statistical models. The wide majority of students excluded had no test score information or information on their school location; these two variables accounted for 99 percent of the missingness. More than half the students missing test scores were classified as special education; the remaining students were not located in the test score file or were exempt. School location came from the Common Core of Data. Students missing this variable attended schools that did not match to this dataset.

Additional details on sample selection and missing data are available from the authors upon request.

## Analytic Strategy

### Research Question #1: What is the relationship between college prep course offerings and school characteristics?

To address this research question, we estimated an ordinary least squares (OLS) regression model with robust standard errors. This was a school-level analysis limited to the 962 Texas public high schools in our sample. The outcome measured the number of unique college prep courses a high school offered. We controlled for five school characteristics variables, which are described in Appendix A.

We also estimated a negative binomial count model and found similar results; this regression table is available from the authors upon request. We reported the OLS results since they were substantively similar and easier to interpret. Additionally, models for Harris County and Houston ISD are available from the authors, although they were somewhat imprecise due to the smaller sample size (N = 72 for Harris County, N = 28 for Houston ISD).

### Research Question #2: What is the relationship between the number of college prep courses taken and college prep course offerings?

For this research question, we used an OLS regression model and clustered standard errors by school. The outcome measured the number of college prep courses a student took during high school, while the key covariate of interest measured the number of unique college prep courses a high school offered. The model controlled for the student and school characteristics listed in Appendix A.

We also estimated a zero-inflated negative binomial count model and found similar results; this regression table is available from the authors upon request. We reported the OLS results since they were substantively similar and easier to interpret. Additionally, models for Harris County and Houston ISD are available from the authors.

### Research Question #3: What is the relationship between postsecondary attainment and the number of college prep courses taken?

While Research Questions #1 and #2 examined which schools and students had access to college prep courses, this research question determined how these courses affected long-term educational outcomes—earning any postsecondary credential or a bachelor's degree within 12 years of high school. A problem with testing the relationship between college prep course-taking and postsecondary attainment was that students who took these courses (and more of them) might have done so because they planned to graduate from college. Therefore, college prep course-taking might be endogenous with respect to postsecondary attainment, and a regression of attainment on course-taking might be biased.

We took a few approaches to endogeneity. First, we included a robust set of student and school characteristics that were thought to predict college prep course-taking and postsecondary attainment. Second, we estimated school fixed-effects models to account for between-school variation in patterns of course-taking and attainment. These models, in effect, controlled for school choice—whether students and their families chose specific schools to maximize their opportunities for college prep coursework and postsecondary attainment. Third, we estimated an instrumental variables (IV) model using two-stage least squares. The instrument we used measured the average college prep curriculum (i.e., mean number of courses students took) at the school-level. The goal of this instrument was to eliminate omitted variable bias tied to unobserved ability or motivation. According to Rose and Betts (2004), the first-stage regression allowed you to parse out these unobservables since "any deviation of the student's actual curriculum from the predicted level [was] assumed to be caused by variations in ability, thus leaving the predicted value independent of ability" (p. 504). Although the instrument had limitations (e.g., high school means might proxy college-going culture) (Altonji, 1992, 1995; Levine & Zimmerman, 1995; Rose & Betts, 2001, 2004), in combination with the school and student controls, we thought it eliminated much bias.

The first-stage model was the following:

$$\widehat{(\text{ColPrep})} = \gamma + \beta X + \theta \text{MeanColPrep} + \omega \qquad (1)$$

where the endogenous variable ColPrep was regressed on exogenous variables X (student and school controls) and the instrumental variable MeanColPrep. The residuals from the model ColPrep — $\widehat{(\text{ColPrep})}$ were assumed to be endogenous, and the exogenous portion $\widehat{(\text{ColPrep})}$ was then used in the second-stage model:

$$\text{PostsecAttain} = \alpha + \beta X + \delta\widehat{(\text{ColPrep})} + \varepsilon \qquad (2)$$

where postsecondary attainment PostsecAttain was regressed on student and school controls and the predicted values of ColPrep from the first-stage. Through this approach, we expected that the estimates of δ would more closely approximate the causal effect of ColPrep on PostsecAttain.

The three models described above were linear probability models and clustered standard errors by school. Abbreviated regression tables for Texas, Harris County, and Houston ISD are available in Appendices D-F; the full tables are available from the authors upon request. IV models were not estimated for Houston ISD because we have failed to reject the null hypothesis that the instrument was weak.

We also estimated logit and probit models and found similar results; these regression tables are available from the authors upon request. We reported the OLS results since they were substantively similar and easier to interpret.

For the results that dichotomize or categorize the number of college prep courses taken, we used the first model (OLS with controls). These results are available from the authors upon request. Graphs were produced using Stata's **`margins`** command.

### Research Question #4: How does the role of college prep course offerings and course-taking differ by student achievement?

For this research question, we estimated OLS regression models similar to those estimated in Research Questions #2 and #3. When testing how the role of college prep course offerings varied by achievement, we interacted the number of course offerings with a student's composite TAAS score. When testing how the number of college prep courses taken varied by achievement, we used the first model (OLS with controls) and interacted course-taking with a student's composite TAAS score. Graphs were produced using Stata's **`margins`** command.

# Appendix C. Regression Models for Research Question #2

**Table C1. Linear Regression Model Predicting the Relationship between College Prep Course-Taking and School-Level College Prep Course Offerings**

| Variables | Coef. | Sig. |
|---|---|---|
| Age | –0.10 | *** |
| Female | 0.35 | *** |
| Race/Ethnicity (ref. = White) | | |
| Black | –0.28 | *** |
| Hispanic | –0.38 | *** |
| Asian | 2.22 | *** |
| English Learner | 0.16 | * |
| Special Education | 1.08 | *** |
| Economic Disadvantage | –0.17 | *** |
| Attendance Rate (in 10s) | 1.56 | *** |
| Composite TAAS Score (standardized) | 2.31 | *** |
| No. Dual Credit Courses | –0.31 | *** |
| No. CTE Courses | –0.30 | *** |
| Total No. Courses | 0.13 | *** |
| High School Graduation Program (ref. = Minimum) | | |
| Recommended | 0.44 | *** |
| Distinguished | 4.33 | *** |
| College Plans | 0.35 | *** |
| No. College Prep Courses Offered | 0.06 | *** |
| Pct. Underrepresented Minority (in 10s) | 0.13 | *** |
| Pct. Economic Disadvantage (in 10s) | 0.07 | |
| Avg. SAT Score (in 100s) | –0.06 | |
| Size (in 100s) | –0.05 | *** |
| Rural | –0.03 | |
| Intercept | –17.34 | *** |
| $R^2$ | | 0.52 |

*Notes:* Sample includes 121,784 students. Clustered standard errors are in parentheses. Please refer to Appendix A for variable descriptions.

* p<0.10, ** p<0.05, *** p<0.01 (two-tailed tests)

# Appendix D. Regression Models for Research Question #3: Texas Sample

| Table D1. Linear Probability Models Predicting the Relationship between Earning a Postsecondary Credential and College Prep Course-Taking | | | | | | |
|---|---|---|---|---|---|---|
| **Panel A. All Students (N = 121,784)** | | | | | | |
| | (1) | | (2) | | (3) | |
| No. College Prep Courses Taken | 0.01 | *** | 0.01 | *** | 0.00 | |
| | (0.00) | | (0.00) | | (0.01) | |
| $R^2$ | 0.19 | | 0.21 | | 0.19 | |
| | | | | | | |
| **Panel B. Students Who Enrolled in Any College Immediately after H.S. (N = 70,498)** | | | | | | |
| | (1) | | (2) | | (3) | |
| No. College Prep Courses Taken | 0.02 | *** | 0.02 | *** | 0.02 | *** |
| | (0.00) | | (0.00) | | (0.00) | |
| $R^2$ | 0.18 | | 0.20 | | 0.18 | |
| | | | | | | |
| Controls: | | | | | | |
| Sociodemographic Characteristics | Yes | | Yes | | Yes | |
| Behavioral/Academic Characteristics | Yes | | Yes | | Yes | |
| School Characteristics | Yes | | No | | Yes | |
| Estimation Method | OLS | | FE | | IV | |

*Notes*: Clustered standard errors are in parentheses. In the first-stage regression of the IV-estimated model, the *P*-value for the *F*-test of the hypothesis that the coefficient on the school-average instrument is equal to 0 is 0.0000. Please refer to Appendix A for variable descriptions.

* p<0.10, ** p<0.05, *** p<0.01 (two-tailed tests)

| Table D2. Linear Probability Models Predicting the Relationship between Earning a Bachelor's Degree and College Prep Course-Taking | | | | | | |
|---|---|---|---|---|---|---|
| **Panel A. All Students (N = 121,784)** | | | | | | |
| | (1) | | (2) | | (3) | |
| No. College Prep Courses Taken | 0.02 | *** | 0.02 | *** | 0.01 | ** |
| | (0.00) | | (0.00) | | (0.01) | |
| $R^2$ | 0.26 | | 0.28 | | 0.26 | |
| | | | | | | |
| **Panel B. Students Who Enrolled in a Four-Year College Immediately after H.S. (N = 37,583)** | | | | | | |
| | (1) | | (2) | | (3) | |
| No. College Prep Courses Taken | 0.01 | *** | 0.02 | *** | 0.02 | *** |
| | (0.00) | | (0.00) | | (0.01) | |
| $R^2$ | 0.19 | | 0.22 | | 0.19 | |
| | | | | | | |
| Controls: | | | | | | |
| Sociodemographic Characteristics | Yes | | Yes | | Yes | |
| Behavioral/Academic Characteristics | Yes | | Yes | | Yes | |
| School Characteristics | Yes | | No | | Yes | |
| Estimation Method | OLS | | FE | | IV | |

*Notes*: Clustered standard errors are in parentheses. In the first-stage regression of the IV-estimated model, the *P*-value for the *F*-test of the hypothesis that the coefficient on the school-average instrument is equal to 0 is 0.0000. Please refer to Appendix A for variable descriptions.

* p<0.10, ** p<0.05, *** p<0.01 (two-tailed tests)

# Appendix E. Regression Models for Research Question #3: Harris County Sample

| Table E1. Linear Probability Models Predicting the Relationship between Earning a Postsecondary Credential and College Prep Course-Taking | | | | | | |
|---|---|---|---|---|---|---|
| **Panel A. All Students (N = 18,525)** | | | | | | |
| | (1) | | (2) | | (3) | |
| No. College Prep Courses Taken | 0.01 | *** | 0.01 | *** | 0.00 | |
| | (0.00) | | (0.00) | | (0.01) | |
| $R^2$ | 0.19 | | 0.20 | | 0.19 | |
| | | | | | | |
| **Panel B. Students Who Enrolled in Any College Immediately after H.S. (N = 10,622)** | | | | | | |
| | (1) | | (2) | | (3) | |
| No. College Prep Courses Taken | 0.02 | *** | 0.02 | *** | 0.03 | *** |
| | (0.00) | | (0.00) | | (0.01) | |
| $R^2$ | 0.20 | | 0.21 | | 0.19 | |
| | | | | | | |
| Controls: | | | | | | |
| Sociodemographic Characteristics | Yes | | Yes | | Yes | |
| Behavioral/Academic Characteristics | Yes | | Yes | | Yes | |
| School Characteristics | Yes | | No | | Yes | |
| Estimation Method | OLS | | FE | | IV | |

*Notes*: Clustered standard errors are in parentheses. In the first-stage regression of the IV-estimated model, the *P*-value for the *F*-test of the hypothesis that the coefficient on the school-average instrument is equal to 0 is 0.0000. Please refer to Appendix A for variable descriptions.

* p<0.10, ** p<0.05, *** p<0.01 (two-tailed tests)

| Table E2. Linear Probability Models Predicting the Relationship between Earning a Bachelor's Degree and College Prep Course-Taking | | | | | | |
|---|---|---|---|---|---|---|
| **Panel A. All Students (N = 18,525)** | | | | | | |
| | (1) | | (2) | | (3) | |
| No. College Prep Courses Taken | 0.02 | *** | 0.02 | *** | 0.02 | * |
| | (0.00) | | (0.00) | | (0.01) | |
| $R^2$ | 0.25 | | 0.27 | | 0.25 | |
| | | | | | | |
| **Panel B. Students Who Enrolled in a Four-Year College Immediately after H.S. (N = 6,237)** | | | | | | |
| | (1) | | (2) | | (3) | |
| No. College Prep Courses Taken | 0.01 | *** | 0.01 | *** | 0.02 | |
| | (0.00) | | (0.00) | | (0.01) | |
| $R^2$ | 0.23 | | 0.25 | | 0.23 | |
| | | | | | | |
| Controls: | | | | | | |
| Sociodemographic Characteristics | Yes | | Yes | | Yes | |
| Behavioral/Academic Characteristics | Yes | | Yes | | Yes | |
| School Characteristics | Yes | | No | | Yes | |
| Estimation Method | OLS | | FE | | IV | |

*Notes*: Clustered standard errors are in parentheses. In the first-stage regression of the IV-estimated model, the *P*-value for the *F*-test of the hypothesis that the coefficient on the school-average instrument is equal to 0 is 0.0000. Please refer to Appendix A for variable descriptions.

* p<0.10, ** p<0.05, *** p<0.01 (two-tailed tests)

# Appendix F. Regression Models for Research Question #3: Houston ISD Sample

| Table F1. Linear Probability Models Predicting the Relationship between Earning a Postsecondary Credential and College Prep Course-Taking | | | | |
|---|---|---|---|---|
| **Panel A. All Students (N = 4,089)** | | | | |
| | (1) | | (2) | |
| No. College Prep Courses Taken | 0.01 | *** | 0.01 | *** |
| | (0.00) | | (0.00) | |
| $R^2$ | 0.10 | | 0.11 | |
| | | | | |
| **Panel B. Students Who Enrolled in Any College Immediately after H.S. (N = 1,552)** | | | | |
| | (1) | | (2) | |
| No. College Prep Courses Taken | 0.02 | *** | 0.02 | *** |
| | (0.00) | | (0.00) | |
| $R^2$ | 0.19 | | 0.21 | |
| | | | | |
| Controls: | | | | |
| Sociodemographic Characteristics | Yes | | Yes | |
| Behavioral/Academic Characteristics | Yes | | Yes | |
| School Characteristics | Yes | | No | |
| Estimation Method | OLS | | FE | |

*Notes*: Clustered standard errors are in parentheses. Instrumental variable models are not estimated for the Houston ISD sample since the instrument was determined to be weak. Please refer to Appendix A for variable descriptions.

* p<0.10, ** p<0.05, *** p<0.01 (two-tailed tests)

**Table F2. Linear Probability Models Predicting the Relationship between Earning a Bachelor's Degree and College Prep Course-Taking**

| | | | | |
|---|---|---|---|---|
| **Panel A. All Students (N = 4,089)** | | | | |
| | (1) | | (2) | |
| No. College Prep Courses Taken | 0.01 | *** | 0.01 | *** |
| | (0.00) | | (0.00) | |
| $R^2$ | 0.16 | | 0.17 | |
| | | | | |
| **Panel B. Students Who Enrolled in a Four-Year College Immediately after H.S. (N = 1,178)** | | | | |
| | (1) | | (2) | |
| No. College Prep Courses Taken | 0.02 | *** | 0.02 | *** |
| | (0.00) | | (0.00) | |
| $R^2$ | 0.27 | | 0.29 | |
| | | | | |
| Controls: | | | | |
| Sociodemographic Characteristics | Yes | | Yes | |
| Behavioral/Academic Characteristics | Yes | | Yes | |
| School Characteristics | Yes | | No | |
| Estimation Method | OLS | | FE | |

*Notes*: Clustered standard errors are in parentheses. Instrumental variable models are not estimated for the Houston ISD sample since the instrument was determined to be weak. Please refer to Appendix A for variable descriptions.

* p<0.10, ** p<0.05, *** p<0.01 (two-tailed tests)

## Mission

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