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CollegeBoard

The Earlier the Better? Taking the AP® in 10th Grade

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About the Advanced Placement Program

The College Board's Advanced Placement Program® (AP®) enables willing and academically prepared students to pursue college-level studies — with the opportunity to earn college credit, advanced placement or both – while still in high school. Through AP courses in 34 subjects, each culminating in a rigorous exam, students learn to think critically, construct solid arguments and see many sides of an issue — skills that prepare them for college and beyond. Taking AP courses demonstrates to college admission officers that students have sought the most rigorous curriculum available to them, and research indicates that students who score a 3 or higher on an AP Exam typically experience greater academic success in college and are more likely to earn a college degree than non-AP students. Each AP teacher's syllabus is evaluated and approved by faculty from some of the nation's leading colleges and universities, and AP Exams are developed and scored by college faculty and experienced AP teachers. Most four-year colleges and universities in the United States grant credit, advanced placement or both on the basis of successful AP Exam scores – more than 3,600 institutions worldwide annually receive AP scores. In the last decade, participation in the AP Program has more than doubled and graduates succeeding on AP Exams have nearly doubled. In May 2011, nearly 2 million students representing more than 18,000 schools around the world, both public and nonpublic, took 3.4 million AP Exams.

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The College Board's mission is to connect students to college success and opportunity. We are a not-for-profit membership organization committed to excellence and equity in education.

The College Board

The College Board is a mission-driven not-for-profit organization that connects students to college success and opportunity. Founded in 1900, the College Board was created to expand access to higher education. Today, the membership association is made up of over 6,000 of the world's leading educational institutions and is dedicated to promoting excellence and equity in education. Each year, the College Board helps more than seven million students prepare for a successful transition to college through programs and services in college readiness and college success — including the SAT® and the Advanced Placement Program®. The organization also serves the education community through research and advocacy on behalf of students, educators and schools. For further information, visit www.collegeboard.org.

RESEARCH

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Contents

Executive Summary

In this report, we examine the impact of scoring a 1 or 2 on an AP® Exam in 10th grade on later AP Exam participation and performance. As access to AP courses increases within and across schools, a growing number of students are taking AP courses and exams in the earlier grades of high school. Using a matched sample of AP and no-AP students, this study explored the following research questions for seven AP Exams: Are students who receive a 1 or 2 on an AP Exam in the 10th grade more likely to take an exam in subsequent grades than students who did not take any exams in 9th or 10th grade? Are these students more likely to pass a later exam than students who did not take any exams in the 9th or 10th grade? Results showed that regardless of AP Exam subject, 10th-graders who scored a 1 or 2 were significantly more likely to take an AP Exam later in high school than comparable students who did not take an early AP Exam. However, the seven exams yielded different results in the likelihood of students scoring 3 or higher on an AP Exam in the 11th or 12th grade.

Introduction

In recent years the number of students participating in the Advanced Placement® (AP) Program has increased markedly. Between 2006 and 2011, the number of high school graduates who took at least one AP Exam increased by 40% (College Board, 2012). Success rates, in turn, have remained relatively stable: in 2006, 62% of graduating high school students who took an AP Exam scored 3 or higher on at least one exam; this success rate was 60% in 2011. While the vast majority of AP examinees take AP Exams in 11th or 12th grade, the proportion of examinees in 9th and 10th grade increased over this same 2006 to 2011 period, from 10% to 20% (College Board, 2006; College Board, 2011). Success rates in 2011 for 9th- and 10th-graders were 55%[1], while they were 59% for 11th- and 12th-graders.

Many researchers argue that rigorous course work in high school prepares students for college (Adelman, 2006; Engberg & Wolniak, 2009), and research on AP Exam takers specifically suggests benefits to students in college outcomes (Mattern, Shaw, & Xiong, 2009; Murphy & Dodd, 2009). This research seems to support policies to expand AP programs in schools to reach more students. Proponents of AP expansion argue the exposure to AP in high school has value irrespective of exam score (College Board, 2001; Wakelyn, 2009), and may include the acquisition of study skills, habits of thought, and other competencies that are not assessed in culminating exams but produce better learners and help to prepare students for the rigors of college-level courses. Consistent with this argument, those who take early AP courses, even without exam success, would potentially gain the confidence to attempt additional rigorous course work while in high school as well as gain skills that would enable them to be successful on future AP Exams.

However, much of the research on AP has found the value of AP to be largely concentrated among students who score a 3 or higher on the culminating exam for the course, not among students who score a 1 or 2 . Additionally, much of the research on AP does not explicitly consider students who take AP early in high school. Some contend that the AP Program is not designed for expansion into the early high school grades and is therefore not beneficial to students (Mathews, 2010). If AP expansion means including more students who are unprepared for these courses, then expanding programs to reach earlier into high school may not offer the benefits of AP participation that have been noted in previous research.

Currently, we do not know what benefits or disadvantages emerge among students who take AP Exams in early grades, particularly among those who do not receive a 3 or higher on the exam. The purpose of the research study is to better understand whether taking AP early in high school without success (a score of 3 or higher) on the associated exam increases a student's likelihood of taking an AP later in high school, and increases his or her likelihood of scoring a 3 or higher on a later AP Exam. We focus on 10th-graders in order to include a

Does scoring a 1 or 2 on an early AP Exam increase a student's likelihood of taking an AP later in high school or of succeeding on that later exam?

1. These success rates by grade level represent exams taken in a given year, while the earlier success rates represent graduating seniors who could have taken an AP Exam at any grade level while in high school.

measure of prior achievement in our study: PSAT/NMSQT® (PN) assessment scores taken by students at the beginning of 10th grade. This study examines the following research questions for seven AP Exams:

1. Are students who receive a 1 or 2 on an AP Exam in the 10th grade more likely to take an exam in 11th or 12th grade than similar students who did not take any early AP Exams?

2. Conditional on taking an AP Exam in 11th or 12th grade, are students who receive a 1 or 2 on an AP Exam in the 10th grade more likely to pass an exam in the 11th or 12th grade than similar students who did not take any early AP Exams?

Data and Methods

Using College Board data that combine AP Exam score history of students with their PSAT/NMSQT (PN) exam information and student demographic characteristics, we selected public school students who had taken the PN in 10th grade and were in the 2010 graduating cohort. After removing students with missing information, the resultant base sample included 1,086,710 students. Overall, 12.5% of students (N = 136,164) had taken at least one AP in 10th grade in 2008. We focused on 10th-graders who scored a 1 or 2 on an AP Exam in one of seven of the more popular early AP subjects: World History, European History, U.S. History, Biology, U.S. Government and Politics, Human Geography, and Psychology (See Table 1).

Table 1.

The 10 Most Popular AP Exams for 10th-Grade Exam Takers in 2008 by Subject

AP Exam Subject	# of Examinees	Included in analysis
World History	95,405	✓
European History	52,508	✓
U.S. History	29,720	✓
Biology	14,454	✓
Spanish Language	11,317	
U.S. Government and Politics	9,769	✓
Human Geography	6,953	✓
Chemistry	6,063	
English Language and Composition	5,284	
Psychology	4,404	✓

Source: College Board, 2008. *AP Program Summary Report* 2008.
Retrieved from http://professionals.collegeboard.com/profdownload/ap-data-2008-Program-Summary-Report.pdf

Students are not randomly assigned to AP courses, and higher-achieving students tend to be more likely to elect into AP (Iatarola, Conger, & Long, 2011; Jeong, 2009; Zietz & Joshi, 2005). We account for this potential selection effect through the statistical method of propensity score matching (Rosenbaum, 2010). This method uses characteristics of students in our AP sample to identify similar no-AP students, and then matches AP students one by one to students in the no-AP group. The matched sample is then used to compare later AP Exam outcomes among the two groups.

While we were not able to capture all of the various characteristics that may be used to determine a student's likelihood of taking an AP Exam, we were able to include some critical ones. Along with prior achievement measures through PN exam scores on sections of critical reading, writing, and mathematics, some additional information was gathered from students at the time of the PN assessment. This included background characteristics of gender, race, and student reported grade point average at the time of the PN administration (October of 2008). We also included the number of AP Exam subjects that 10th-graders took in a school to get a measure of the opportunity a student had to access AP courses and the student's state where they were enrolled in high school to be able to control for state-level policies that would impact a student's likelihood of taking an AP Exam.

To answer our two research questions, we used propensity score matching methods to create a comparable set of students for each of the seven AP subjects, resulting in 14 matched sets. To explain this process in greater detail, we use the matching process for AP World History as an example. We began with research question 1: Are students who receive a 1 or 2 on the AP World History exam in the 10th grade more likely to take an exam in 11th or 12th grade than similar students who did not take any early AP Exams? Before matching, 34,138 students were in the treatment group — any student who received a 1 or 2 on the AP World History exam in the 10th grade, and 945,324 students were in the control group — any student who did not take any AP Exams in the 9th or 10th grade. We used logistic (logit) regression to model the likelihood of each student being in the AP treatment group, given the "pre-AP" characteristics discussed earlier. With the logistic regression results, we generated a propensity score that estimates the likelihood of being in the AP World History group. We matched each AP case to the closest no-AP case based on propensity scores, with AP and no-AP students randomly sorted so as not to introduce bias in terms of who was matched first. We also used caliper matching in the SAS greedy match macro (in our case, we required a caliper of 0.01) (Parsons, 2001).

In the resulting sample, 34,106 AP World History 10th-grade examinees who scored a 1 or 2 were matched to 34,106 students with no early AP Exams but similar background characteristics. In the first and second column of Table A1, we present the *d*-statistics for the unmatched and matched World History sample. A *d*-statistic, as discussed by Austin (2009), indicates whether two groups are balanced on a given characteristic of interest. A *d*-statistic between -.10 and .10 is considered balanced, while a *d*-statistic greater than .10 indicates higher incidence among the AP group, and a *d*-statistic below -.10 indicates higher incidence among the no-AP group. Thus, for example, the *d*-statistic for GPA of the unmatched World History sample is .60, which suggests that AP World History examinees (before matching) have much higher GPAs than students with no early AP Exam experience. After the matching

10th-grade students scoring a 1 or 2 on an AP Exam were matched to students who took no early AP Exams on: gender, race, GPA, PN critical reading, mathematics, and writing scores, number of AP Exam subjects taken by 10th-graders in a student's school, and state.

process, this *d*-statistic is reduced to -0.01, which suggests that the AP students in the matched sample have been matched to no-AP students with very similar GPAs.

To consider research question 2, regarding later AP Exam score outcomes for each AP subject, we repeated the matching procedure while limiting our sample to students who took an AP Exam in 11th or 12th grade. Thus, for the case of World History we matched students who took AP Exam subject in 10th grade (N = 27,490) to students who did not have this early AP exposure but did take later AP Exams (N = 290,874). As with the matching process for research question 1, our matched sample for research question 2 was balanced and we were able to keep most of the AP Examinees in the matched sample (N = 27,398). We repeated this approach for the remaining six AP Exam subjects, and were able to achieve balanced samples for all groups (see Tables A2–A7).

Results and Discussion

Results showed that regardless of AP Exam subject, 10th-graders without AP Exam success were significantly more likely, with small to medium effect sizes, to take an AP Exam later in high school than comparable students who did not take an early AP Exam (see Table 2). However, the seven exams yielded different results in the likelihood of students scoring 3 or higher on an AP Exam in the 11th or 12th grade. Relative to comparable students who did not take an early AP Exam but took one or more AP Exams later, 10th-grade students who scored a 1 or 2 on the AP Biology, European History, U.S. Government and Politics, or U.S. History exams were significantly more likely to score 3 or higher on a later AP Exam. Tenth-grade students who scored a 1 or 2 on the AP Psychology Exam were just as likely to score a 3 or higher on a later AP Exam as a comparable group of no-early-AP students. Tenth-graders scoring a 1 or 2 on the AP Human Geography or World History exams were significantly less likely to score 3 or higher on a later AP Exam than their no-early-AP counterparts. However, in all results for later AP Exam success, the magnitudes of the differences are small with nonsignificant effect sizes.

Regardless of AP Exam subject, 10th-graders without AP Exam success were significantly more likely, with small to medium effect sizes, to take an AP Exam later in high school than comparable students who did not take an early AP Exam.

Table 2.

Later AP Outcomes Comparing Students Receiving a 1 or 2 on the AP Exam in 10th Grade to Matched Sample of Students Taking No AP Exam in 9th or 10th Grade

	AP 10th score 1 or 2	No AP 9th or 10th	*p*~	Cohen's *w*
Percentage taking AP 11th or 12th grade				
World History	80.5	49.8	***	med
Biology	83.8	57.0	***	med
Human Geography	77.5	47.1	***	med
Psychology	73.7	50.3	***	sm
U.S. History	79.0	56.9	***	sm
European History	83.4	56.0	***	med
U.S. Government and Politics	76.4	57.0	***	sm
Percentage scoring 3+ on later AP				
World History	53.7	54.6	*	*ns*
Biology	66.5	62.2	***	*ns*
Human Geography	44.6	51.2	***	*ns*
Psychology	50.0	54.4	ns	*ns*
U.S. History	66.5	63.1	***	*ns*
European History	67.3	64.4	***	*ns*
U.S. Government and Politics	65.2	61.1	**	*ns*

Note: Significance tests (*p*) and the strength of the effect size (Cohen's *w*) are based on chi-square results between students who scored a 1 or 2 on the AP Exam and those who had no early AP, where $p < .05$ *, $p < .01$** or $p < .001$*** and where w = phi coefficient: small effect >.10 sm, medium effect > .30 to .50 med, large effect > .50 lrg. A *p*-value of >.05 or a *w*-value of < .10 are considered not significant *ns*.

Tenth-graders who did not experience exam success on one of the seven AP Exam subjects do not appear to be dissuaded from trying again on a subsequent AP Exam. Thus, early AP Exam exposure — even without exam success — is related to a student's likelihood of taking an AP Exam later in school, increasing the overall rigor of their high school courses. While we did not find early AP Exam takers were consistently more likely to be successful on AP Exams in later years of high school, this does not mean there are no benefits in taking early AP courses. Recent research on college benefits of AP course-taking found that students taking multiple AP courses were more likely to attend college and attend more selective colleges, irrespective of AP Exam performance (McKillip & Cooney, 2012). Our current findings suggest that students taking early AP Exams are more likely to be in this group of students taking multiple AP courses than their similar peers without early AP Exam exposure.

Since results of all seven exams varied in the likelihood of students passing an AP in 11th or 12th grade, it seems that either different types of students are motivated to take different AP courses and exams (differences in student characteristics as inputs) or the AP courses related to the exams may prepare students differently for subsequent course-taking (differences in skills as outputs) when compared to those who did not take any AP Exams early in high school. Though the likelihood of later exam success varied, in each case the strength of the effect was weak, so we caution against drawing conclusions regarding the positive and

negative impacts of specific early AP courses on later student performance. Further research is needed to discover other factors that might be leading to these mixed results.

As with any quantitative study, there are limitations in the ability to exhaustively measure student and school characteristics that would explain the variation in outcomes. This is particularly true of the logistic regression model we used to match students. Though we include a measure of the number of AP Exam subjects completed by students in 10th grade in a student's high school, future research would benefit from the addition of other high school characteristics in the models (Iatarola, Conger, & Long, 2011). For example, multilevel analyses that include the size and strength of AP programs as measured by the percentage of students taking AP Exams or the number of students in a given AP class who have success on the end-of-course exam may have a strong impact on a student's AP participation and performance. In addition, as our study only considers those students who actually took an AP Exam, we are limited in our ability to draw conclusions about AP course-taking patterns. Many students take the AP course without taking the end-of-course exam, and may be inadvertently included in our samples among "no-AP" students.

The likelihood of later exam success varied by subject, and in each case the strength of the effect was weak. We cannot draw definitive conclusions regarding the relationship between scoring a 1 or 2 on an early AP and later AP Exam performance.

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Appendix

Table A1.

AP World History in 10th Grade

Pre-Matched and Matched Comparisons for Students Taking the AP World History Exam in 10th Grade and Scoring a 1 or 2, for All Students and Among Students Who Took a Later AP Exam in 11th or 12th Grade

	All 1s and 2s		Among Later AP Exam Takers	
	Pre-Match	**Matched**	**Pre-Match**	**Matched**
AP 10th score 1 or 2 N	34,138	34,106	27,490	27,398
No AP 9th or 10th N	945,324	34,106	290,874	27,398
	d	***d***	***d***	***d***
GPA (10th grade)	0.60	-0.01	0.00	0.01
PSAT/NMSQT score				
Critical Reading	0.60	0.01	-0.07	0.01
Mathematics	0.63	0.01	-0.03	0.01
Writing	0.62	0.01	-0.03	0.02
Female	0.21	0.01	0.11	0.01
Race/Ethnicity				
American Indian	-0.03	0.00	0.00	0.00
Asian/Pacific Islander	0.20	0.02	0.07	0.00
Black	-0.14	0.01	0.05	0.01
Mexican	0.08	0.00	0.14	0.00
Puerto Rican	-0.04	0.00	0.03	0.01
Other Hispanic	0.00	-0.01	0.05	-0.01
White	-0.04	-0.01	-0.21	0.00
Other	0.02	0.00	0.03	0.01
School-Level AP	0.64	0.03	0.56	0.00

Note: *D*-statistic from Austin (2009), $d = (M_{treatment} - M_{control}) / \sqrt{((SD_T^2 + SD_C^2) / 2)}$ or $d = (P_{treatment} - P_{control}) / \sqrt{((P_T (1-P_T) + P_C (1-P_C)) / 2)}$ where M = mean, SD = standard deviation, P = percent. A *d* under ±.10 indicates a balanced sample; greater than .10 indicates higher incidence among the AP group; less than -.10 indicates higher incidence among the no-AP group. The state of a student's high school was included in the model, but with space constraints is not presented in this table.

Table A2.

AP Biology in 10th Grade

Pre-Matched and Matched Comparisons for Students Taking the AP Biology Exam in 10th Grade and Scoring a 1 or 2, for All Students and Among Students Who Took a Later AP Exam in 11th or 12th Grade

	All 1s and 2s		Among Later AP Exam Takers	
	Pre-Match	**Matched**	**Pre-Match**	**Matched**
AP 10th score 1 or 2 N	3,635	3,635	3,045	3,045
No AP 9th or 10th N	945,324	3,635	290,874	3,045
	d	***d***	***d***	***d***
GPA (10th grade)	0.73	-0.02	0.12	-0.02
PSAT/NMSQT score				
Critical Reading	0.73	0.04	0.09	0.04
Mathematics	0.81	0.03	0.16	0.03
Writing	0.73	0.05	0.09	0.03
Female	0.16	0.00	0.04	-0.02
Race/Ethnicity				
American Indian	-0.02	0.00	0.00	0.02
Asian/Pacific Islander	0.36	0.03	0.24	0.01
Black	-0.20	0.00	-0.01	0.01
Mexican	0.07	0.00	0.14	-0.01
Puerto Rican	-0.06	0.01	0.02	-0.03
Other Hispanic	0.00	-0.01	0.08	0.00
White	-0.13	-0.02	-0.32	0.00
Other	0.05	0.00	0.07	-0.01
School-Level AP	0.65	0.06	0.59	0.03

Note: *D*-statistic from Austin (2009), $d = (M_{treatment} - M_{control}) / \sqrt{((SD_T^2 + SD_C^2)/2)}$ or $d = (P_{treatment} - P_{control}) / \sqrt{((P_T (1-P_T) + P_C (1-P_C))/2)}$ where M = mean, SD = standard deviation, P= percent. A *d* under ±.10 indicates a balanced sample; greater than .10 indicates higher incidence among the AP group; less than -.10 indicates higher incidence among the no-AP group. The state of a student's high school was included in the model, but with space constraints is not presented in this table.

Table A3.

AP Human Geography in 10th Grade

Pre-Matched and Matched Comparisons for Students Taking the AP Human Geography Exam in 10th Grade and Scoring a 1 or 2, for All Students and Among Students Who Took a Later AP Exam in 11th or 12th Grade

	All 1s and 2s		Among Later AP Exam Takers	
	Pre-Match	**Matched**	**Pre-Match**	**Matched**
AP 10th score 1 or 2 N	1,986	1,986	1,540	1,538
No AP 9th or 10th N	945,324	1,986	290,874	1,538
	d	***d***	***d***	***d***
GPA (10th grade)	0.42	-0.03	-0.20	0.04
PSAT/NMSQT score				
Critical Reading	0.45	0.03	-0.26	0.01
Mathematics	0.47	0.08	-0.20	-0.01
Writing	0.46	0.03	-0.22	0.00
Female	0.16	-0.02	0.08	0.01
Race/Ethnicity				
American Indian	-0.01	0.03	0.00	0.00
Asian/Pacific Islander	0.07	0.08	-0.04	-0.02
Black	-0.04	-0.04	0.16	0.04
Mexican	-0.22	0.04	-0.16	0.03
Puerto Rican	-0.04	0.03	0.05	-0.04
Other Hispanic	0.09	-0.01	0.19	-0.05
White	0.04	-0.03	-0.17	0.02
Other	0.04	0.00	0.06	0.01
School-Level AP	1.06	0.04	0.99	0.01

Note: *D*-statistic from Austin (2009), $d = (M_{treatment} - M_{control}) / \sqrt{((SD_T^2 + SD_C^2)/2)}$ or $d = (P_{treatment} - P_{control}) / \sqrt{((P_T (1-P_T) + P_C (1-P_C))/2)}$ where M = mean, SD = standard deviation, P= percent. A *d* under ±.10 indicates a balanced sample; greater than .10 indicates higher incidence among the AP group; less than -.10 indicates higher incidence among the no-AP group. The state of a student's high school was included in the model, but with space constraints is not presented in this table.

Table A4.

AP Psychology in 10th Grade

Pre-Matched and Matched Comparisons for Students Taking the AP Psychology Exam in 10th Grade and Scoring a 1 or 2, for All Students and Among Students Who Took a Later AP Exam in 11th or 12th Grade

	All 1s and 2s		Among Later AP Exam Takers	
	Pre-Match	**Matched**	**Pre-Match**	**Matched**
AP 10th score 1 or 2 N	931	931	686	686
No AP 9th or 10th N	945,324	931	290,874	686
	d	***d***	***d***	***d***
GPA (10th grade)	0.44	0.01	-0.11	-0.07
PSAT/NMSQT score				
Critical Reading	0.59	0.03	-0.08	0.05
Mathematics	0.51	0.00	-0.13	-0.05
Writing	0.54	0.04	-0.11	0.04
Female	0.33	0.03	0.26	0.08
Race/Ethnicity				
American Indian	-0.04	-0.02	0.01	0.04
Asian/Pacific Islander	0.09	0.03	-0.04	-0.09
Black	-0.15	0.01	0.08	-0.02
Mexican	-0.19	-0.04	-0.13	0.01
Puerto Rican	0.03	0.01	0.07	0.03
Other Hispanic	0.12	-0.06	0.20	-0.03
White	0.05	0.01	-0.16	0.05
Other	0.06	0.04	0.10	0.06
School-Level AP	1.27	0.03	1.20	0.00

Note: *D*-statistic from Austin (2009), $d = (M_{treatment} - M_{control}) / \sqrt{((SD_T^2 + SD_C^2) / 2)}$ or $d = (P_{treatment} - P_{control}) / \sqrt{((P_T (1-P_T) + P_C (1-P_C))/2)}$ where M = mean, SD = standard deviation, P= percent. A *d* under ±.10 indicates a balanced sample; greater than .10 indicates higher incidence among the AP group; less than -.10 indicates higher incidence among the no-AP group. The state of a student's high school was included in the model, but with space constraints is not presented in this table.

Table A5.

AP U.S. History in 10th Grade

Pre-Matched and Matched Comparisons for Students Taking the AP U.S. History Exam in 10th Grade and Scoring a 1 or 2, for All Students and Among Students Who Took a Later AP Exam in 11th or 12th Grade

	All 1s and 2s		Among Later AP Exam Takers	
	Pre-Match	**Matched**	**Pre-Match**	**Matched**
AP 10th score 1 or 2 N	6,428	6,424	5,076	5,069
No AP 9th or 10th N	954,324	6,424	290,874	5,069
	d	***d***	***d***	***d***
GPA (10th grade)	0.80	-0.03	0.23	-0.01
PSAT/NMSQT score				
Critical Reading	0.93	0.00	0.29	0.02
Mathematics	0.85	0.01	0.23	0.01
Writing	0.89	0.01	0.27	0.02
Female	0.21	0.01	0.10	-0.01
Race/Ethnicity				
American Indian	-0.01	0.00	0.02	0.02
Asian/Pacific Islander	0.11	0.01	-0.01	0.00
Black	-0.19	0.00	-0.01	0.00
Mexican	-0.26	0.01	-0.22	0.00
Puerto Rican	-0.05	0.01	0.01	0.01
Other Hispanic	-0.23	0.02	-0.18	0.04
White	0.33	-0.02	0.18	-0.03
Other	0.03	0.00	0.04	0.03
School-Level AP	0.19	0.02	0.12	-0.01

Note: *D*-statistic from Austin (2009), $d = (M_{treatment} - M_{control}) / \sqrt{((SD_T^2 + SD_{C2}) / 2)}$ or $d = (P_{treatment} - P_{control}) / \sqrt{((P_T (1-P_T) + P_C (1-P_C)) / 2)}$ where M = mean, SD = standard deviation, P= percent. A *d* under ±.10 indicates a balanced sample; greater than .10 indicates higher incidence among the AP group; less than -.10 indicates higher incidence among the no-AP group. The state of a student's high school was included in the model, but with space constraints is not presented in this table.

Table A6.

AP European History in 10th Grade

Pre-Matched and Matched Comparisons for Students Taking the AP European History Exam in 10th Grade and Scoring a 1 or 2, for All Students and Among Students Who Took a Later AP Exam in 11th or 12th Grade

	All 1s and 2s		Among Later AP Exam Takers	
	Pre-Match	**Matched**	**Pre-Match**	**Matched**
AP 10th score 1 or 2 N	11,263	11,263	9,388	9,388
No AP 9th or 10th N	945,324	11,263	290,874	9,388
	d	***d***	***d***	***d***
GPA (10th grade)	0.59	-0.02	-0.04	0.01
PSAT/NMSQT score				
Critical Reading	0.80	0.05	0.11	0.02
Mathematics	0.82	0.04	0.15	0.02
Writing	0.81	0.06	0.14	0.02
Female	0.18	0.00	0.07	-0.01
Race/Ethnicity				
American Indian	-0.03	0.00	-0.02	0.00
Asian/Pacific Islander	0.33	0.05	0.21	0.02
Black	-0.35	0.02	-0.13	0.01
Mexican	0.01	-0.02	0.07	-0.03
Puerto Rican	-0.05	0.01	0.01	0.00
Other Hispanic	-0.07	-0.02	0.00	0.00
White	0.06	-0.03	-0.13	-0.01
Other	0.05	0.01	0.06	0.01
School-Level AP	0.61	0.07	0.54	0.05

Note: *D*-statistic from Austin (2009), $d = (M_{treatment} - M_{control}) / \sqrt{((SD_T^2 + SD_C^2) / 2)}$ or $d = (P_{treatment} - P_{control}) / \sqrt{((P_T (1-P_T) + P_C (1-P_C))/2)}$ where M = mean, SD = standard deviation, P= percent. A *d* under ±.10 indicates a balanced sample; greater than .10 indicates higher incidence among the AP group; less than -.10 indicates higher incidence among the no-AP group. The state of a student's high school was included in the model, but with space constraints is not presented in this table.

Table A7.

AP U.S. Government and Politics in 10th Grade

Pre-Matched and Matched Comparisons for Students Taking the AP U.S. Government and Politics Exam in 10th Grade and Scoring a 1 or 2, for All Students and Among Students Who Took a Later AP Exam in 11th or 12th Grade

	All 1s and 2s		Among Later AP Exam Takers	
	Pre-Match	**Matched**	**Pre-Match**	**Matched**
AP 10th score 1 or 2 N	3,374	3,367	2,577	2,563
No AP 9th or 10th N	945,324	3,367	290,874	2,563
	d	***d***	***d***	***d***
GPA (10th grade)	0.59	0.01	-0.02	0.02
PSAT/NMSQT score				
Critical Reading	0.85	0.00	0.16	0.00
Mathematics	0.82	0.03	0.16	0.00
Writing	0.86	0.02	0.20	0.01
Female	0.16	0.00	0.04	0.00
Race/Ethnicity				
American Indian	0.02	0.02	0.04	-0.01
Asian/Pacific Islander	0.29	0.06	0.16	0.02
Black	0.01	0.02	0.26	-0.02
Mexican	-0.35	0.01	-0.32	-0.02
Puerto Rican	-0.12	0.01	-0.05	-0.04
Other Hispanic	-0.05	-0.03	-0.04	0.01
White	0.01	0.00	-0.16	0.01
Other	0.03	-0.01	0.02	0.01
School-Level AP	0.67	0.07	0.63	0.04

Note: *D*-statistic from Austin (2009), $d = (M_{treatment} - M_{control}) / \sqrt{((SD_T^2 + SD_C^2)/2)}$ or $d = (P_{treatment} - P_{control}) / \sqrt{((P_T (1-P_T) + P_C (1-P_C))/2)}$ where M = mean, SD = standard deviation, P= percent. A *d* under ±.10 indicates a balanced sample; greater than .10 indicates higher incidence among the AP group; less than -.10 indicates higher incidence among the no-AP group. The state of a student's high school was included in the model, but with space constraints is not presented in this table.

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