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STANDARDIZED TEST SCORES AND ACADEMIC PERFORMANCE AT IVY-PLUS COLLEGES

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ABSTRACT

We analyze admissions and transcript records for students at multiple Ivy-Plus colleges to study the relationship between standardized (SAT/ACT) test scores, high school GPA, and first-year college grades. Standardized test scores predict academic outcomes with a normalized slope four times greater than that from high school GPA, all conditional on students' race, gender, and socioeconomic status. Standardized test scores also exhibit no calibration bias, as they do not underpredict college performance for students from less advantaged backgrounds. Collectively these results suggest that standardized test scores provide important information to measure applicants' academic preparation that is not available elsewhere in the application file.

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Standardized Test Scores and Academic Performance at Ivy-Plus Colleges

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We analyze admissions and transcript records for students at multiple Ivy-Plus colleges to study the relationship between standardized (SAT/ACT) test scores, high school GPA, and first-year college grades. Standardized test scores predict academic outcomes with a normalized slope four times greater than that from high school GPA, all conditional on students' race, gender, and socioeconomic status. Standardized test scores also exhibit no calibration bias, as they do not underpredict college performance for students from less advantaged backgrounds. Collectively these results suggest that standardized test scores provide important information to measure applicants' academic preparation that is not available elsewhere in the application file.

What is the appropriate role of standardized test scores in the admissions process at highly selective colleges? Proponents of their use argue that test scores provide valuable information on students' academic preparation that is crucial in admissions assessments at selective universities (Leonhardt 2024). Detractors argue that test scores are biased against students from less advantaged back-

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grounds, for instance because those students cannot devote the same resources to preparing for the test or relate less well to the cultural content of testing materials, and that alternative measures of academic preparation do not suffer from these problems (Alon and Tienda 2007, Lemann 2000, Lemann 2024). This debate has played out not only in the literature but also in the policies of colleges across the country. By early 2020, several hundred colleges had adopted test-optional admissions policies, in which applicants could choose to submit test scores or not with their application, with a smaller number of others (for instance the University of California system) moving to exclude test scores entirely from the admissions process. Nearly all remaining colleges then adopted test-optional policies during the COVID-19 pandemic, although eight of the twelve Ivy-Plus schools have recently announced a return to test requirements.[1]

We contribute to this debate by analyzing the informational content in SAT and ACT scores for predicting academic performance during students' first year in college. We conduct this analysis in admissions data and academic records from multiple Ivy-Plus colleges for those starting as first-time first-year students between 2017 and 2023. We present three key findings.

First, SAT and ACT scores have substantial predictive power in forecasting students' academic performance. Even when comparing students from the same racial or ethnic and socioeconomic background, students with the highest possible score (i.e., 1600 on the SAT or 36 on the ACT) achieve a first-year college GPA that is 0.43 higher on a 4.0 scale (equal to 1 SD in the college GPA distribution) than students with an SAT score of 1200 or ACT score of 25 (equating to the 75th percentile of the national distribution of scores). These lower-scoring students are also 42 percentage points more likely to struggle academically during their first year (defined as receiving at least one grade of C+ or lower). We also find that students who do not submit test scores (as part of test-optional admissions policies at these schools in 2021-2023) achieve significantly lower levels

[1] Ivy-Plus includes the eight Ivy League colleges plus Chicago, Duke, MIT, and Stanford.

of academic performance in college, equivalent to students who submitted SAT scores of roughly 1300 or ACT scores of 28.

Second, in contrast with standardized test scores, high school GPA has relatively little predictive power for academic success during a student's first year. Comparing students with a perfect 4.0 high school GPA to those with a 3.2 GPA – a gap of the same magnitude in the distribution of applicants as the test score gap discussed above – predicts a difference in first-year college GPA of less than 0.1. These findings align with those in Chetty, Deming and Friedman (2023), who show that, for Ivy-Plus students, SAT and ACT scores similarly outperform high school GPA in predicting early-career outcomes such as attending a top-ranked graduate program or working at a prestigious firm.

Third, SAT and ACT scores exhibit no calibration bias, in that students from different backgrounds but sharing the same test scores achieve similar average levels of academic success in college. This test follows the literature on algorithmic bias (e.g., Obermeyer et al. 2019) and notably differs from common uses of "bias" in discussion of test scores (that instead focus on differences in the average level of test scores). Because students from different backgrounds experience disparities in school quality, neighborhood exposure, and other environmental differences throughout childhood, each of which affects academic preparation, comparisons of the average levels of testing across students will not generally isolate calibration bias.

Collectively, these results suggest that standardized test scores provide important information to measure applicants' academic preparation that is not available elsewhere in the application file. The remainder of this paper describes the data (Section 1), empirical approach (Section 2), and findings (Section 3). We conclude (Section 4) with a discussion of the implications of these findings for admissions practice, including a discussion of additional considerations around test-optional admissions policies (in contrast to policies that require or do not accept test scores).

I. Data Description

We combine student-level data from the admissions process and the Office of Institutional Research for first-year first-time students from multiple Ivy-Plus colleges. We include all students in the first-year classes who started in Fall of 2017-2023 (excluding Fall of 2020, due to the disruption from COVID-19) who reported high school GPA and completed the required minimum number of courses during their first full year.

Our key admissions variables are SAT/ACT test scores and high school GPA. We observe unweighted high school GPA on the standard 4.0 scale. When high schools do not use this scale, we use the admission offices' conversion to this scale. We omit the small number of students from high schools without any reported GPA. We denote standardized test scores using the SAT Composite scale (which sums the score on the Math exam and the Evidence Based Reading and Writing exam) from 400 to 1600. When students submit ACT but not SAT scores, we take the composite ACT score and then convert it to the SAT's scale using scale equivalence tables from ACT and CollegeBoard. We exclude the small number of students without test scores before test-optional policies came into effect at many colleges in 2020. When students submit both SAT and ACT scores, we take the higher value.

We also measure a range of other student characteristics (such as student demographics and schooling background) from admissions records. We observe students' gender, race and ethnicity, first-generation college status and whether a student is a U.S. citizen or permanent resident from self-reported information on applications. We define a student as from a historically underrepresented racial or ethnic group (i.e., URM) if a student self-identifies as Black, Hispanic, American Indian or Alaskan Native, or Native Hawaiian and Pacific Islander. We define legacy students as those with at least one parent who graduated from the same institution as an undergraduate (based on self-reported data from admissions records). We observe admissions offices' classification of whether students' homes are in rural areas. We observe whether a student applied in an early action or early decision round, and whether that student was classified as an athletic recruit, from admissions office data. We observe family income for those students who apply for financial aid; we break this group into terciles and include an indicator for each, plus a fourth indicator for family income missing, which generally occurs in cases where the student is not applying for financial aid. Finally, we include indicators for each student based on their high school's decile on an index of challenge indicators that capture educational opportunities or disadvantages in the high school environment, variables that feed into the CollegeBoard Landscape tool. We classify high schools that fall in the bottom 20 percent of this index of disadvantage as "advantaged." 75 percent of applicants to our Ivy-Plus colleges come from advantaged high schools with this definition.

Our academic outcome variables come from administrative records at each partner college. We observe seven cohorts of students entering as first-time first-year students in the Fall of 2017-2023. College GPA is measured on the standard scale out of 4.0. Our baseline specifications omit pass/fail courses, although including such courses (and coding grades of "Pass" as equivalent to a "B") does not affect the results. Even in such robustness checks, we omit any grades taken during terms in which grades were "mandatory pass/fail" due to the COVID-19 pandemic.

We define three outcome variables based on a student's grades in their first year of college. Our main outcome variable is first-year cumulative GPA (scaled in the standard way as above); the mean of first-year cumulative GPA across our colleges is 3.49 (on a 4.0 scale), with a (within-school-year) SD of 0.47. We additionally analyze two further measures of performance: percent of grades that are A or A- (63% on average in our sample) and an indicator for academic struggle, defined as having any grade of C+ or lower in the first year (25% on average in our sample). [2]

[2]Our data do not include information on the full distribution of grades for students starting as first-years in Fall 2019; we thus include only students from the remaining six cohorts when using either of

II. Empirical Approach

We regress our three outcome measures on SAT/ACTs, high school GPA, and various sets of controls and interactions of the controls. Our specification is

$$\begin{aligned} Y_i = &\beta_1 * SAT_i + \beta_2 * \mathbf{1}\{SATMISSING_i\} + \\ &\beta_3 * HSGPA_i + \mu_{s(i)t(i)} + \delta_{h(i)} + \gamma X_i + \epsilon_i, \end{aligned}$$

where Y_i is one of our academic outcomes for student i. Our key dependent variable is a student's standardized test score (SAT_i); we also include an indicator variable for students admitted without test scores during test-optional admissions cycles. For interpretability, we normalize test scores to 0 for students with an SAT score of 1400 (ACT score of 31) and divide by 100; because we impute $SAT_i = 0$ for students' missing test scores, readers can interpret the coefficient β_2 as the extent to which students without test scores differ in their outcomes from students scoring 1400 on the SAT. All specifications include college-year fixed effects ($\mu_{s(i)t(i)}$). We then control for additional variables in certain specifications, including a vector of individual level characteristics $\mathbf{X_i}$ (including a student's gender, legacy status, early decision applicant status, URM status, athletic recruit status, first-generation college status, rural/urban home, U.S. citizen or permanent resident, family income, and high school challenge index) and fixed effects for the high school from which they applied to college ($\delta_{h(i)}$).[3]

In addition to our baseline specification in equation (1), we also test for calibration bias in test scores by separately estimating the relationship between

these alternative performance measures of academic struggle or the percent of grades that are As as the dependent variable.

[3]Rothstein (2004) notes that equation (1) may produce biased estimates because we can only estimate it on students who attend, rather than on all applicants. Intuitively, students admitted with particularly low SAT/ACT scores must have had some other countervailing factors; if these other factors positively (negatively) predict first-year college GPA, then the estimates would be negatively (positively) biased. If these other factors correlate in the same way with SAT/ACT scores as with high school GPA, however, it would not affect the comparison between β_1 and β_3, and thus would not affect the qualitative conclusions from this analysis. Similarly, if these other factors correlate in the same way with SAT/ACT scores within different student sub-populations, it would not affect our test for bias.

test scores and academic performance in college for students from different subgroups. To do so, we augment equation (1) with two additional terms: interactions between an indicator G_i and each of our test score variables (SAT_i and $\mathbf{1}\{SATMISSING_i\}$). We do so using four different definitions of G_i: students who attend a high school above the national 20th percentile on our index of high school challenge indicators, first generation students, students from families with incomes in the first tercile of distribution (below \$91,800), and students from underrepresented racial and ethnic groups (URM students).

III. Results

A. Association of Test Scores and Academic Performance

Figure 1a presents a non-parametric representation of the association between test scores and first-year college GPA from Equation (1), including all control variables. More specifically, we estimate a version of equation (1) replacing the linear control for SAT with 17 indicators for quantiles of the test score distribution (since we observe test scores for roughly 85% of students). We then plot the value of these 17 coefficients (y-value) vs. the average value of test score for students in each quantile (x-value), along with the coefficient for the remaining 15% students missing a test score (on the right). The best-fit line plots the linear fit from the microdata.

There is a robust and linear relationship between test scores and first-year college GPA. This relationship is highly statistically significant and economically meaningful; moving from students with perfect scores to those with SAT scores of 1200 (or ACT scores of 25) predicts a 0.47 lower GPA, a shift that is 1 SD in the distribution of first-year GPA. Students who do not submit test scores (represented by the last dot on the right) achieve quite low first-year grades; on average, they receive the same first-year college GPA as students who reported an SAT score of just below 1300.

Figure 1b presents the same non-parametric relationship but for high school

GPA; in contrast with SAT/ACT scores, high school GPA has a relatively weak relationship with academic performance in college. Decreasing a student's high school GPA from 4.0 to 3.2 predicts a fall of less than 0.1 in a students' first year college GPA.

Motivated by the strongly linear relationship, we report the results of different versions of equation (1) in Table 1, Panel A. Column (4) matches the specification with controls shown in Figure 1a. Column (1) uses just SAT/ACT scores and only controls for college effects and year effects. Test scores (or their absence) alone predict 19 percent of the variation in cumulative GPA. In Column (2), we repeat the specification but with only high school GPA; the R-squared of this variable is lower than test scores. We combine both measures in Column (3).

We add further controls to the specification in Table 1a in Columns (5) and (6). In Column (5), we interact the indicators for gender, race and ethnicity, and family income; the key coefficients remain essentially unchanged from our baseline specification in Column (4). In Column (6) we include high school fixed effects; the coefficient on test score falls somewhat, while the coefficient on high school GPA rise. Still, the predicted change in academic outcomes for a 1 standard deviation increase in test score (0.215) is larger than for a 1 standard deviation increase in high school GPA (0.092) in each of the three panels.

We also study the association of test scores with other measures of academic outcomes. In Figure 1c and 1d (and in Table 1, Panel B) we present results using a student's fraction of As during their first year; in Figure 1e and 1f (and in Table 1, Panel C) we present results using our indicator for academic struggle, defined as a student receiving at least one grade of C+ or below during their first year. The results are consistent with those discussed above; across all specifications, test scores explain a larger share of the variation in college academic performance than high school GPA.

B. Testing for Bias in Scores

Having established that test scores include important and distinctive predictive power for students' future academic outcomes, we now test whether those predictions exhibit calibration bias. The intuition behind our test is straightforward: if test scores are biased against a certain group of students, then those students will have a higher level of underlying academic preparation as compared to others with the same score, leading them to outperform academically once in college and judged in a system without such bias. Such might be the case if, for instance, students from advantaged backgrounds had more resources with which to prepare specifically for the SAT or ACT, inflating their test scores relative to others with the same underlying level of academic preparation but lacking these extra resources.

Figure 2a shows a non-parametric representation of our test for bias between students attending more vs. less advantaged high schools. The relationship between test SAT/ACT scores and first-year college GPA is quite similar for all students, no matter the advantage of the high school they attended. Although not statistically distinguishable, the point estimates suggest that students from less advantaged high school slightly underperform their peers from more advantaged high schools with the same test scores. Figure 2b replicates this test for bias between URM and non-URM students; we similarly find that non-URM students slightly outperform URM students with the same SAT/ACT scores, though the relationship (while statistically significant) is not large. Figures 2c and 2d similarly replicate the test for calibration bias for our academic struggle outcome. Indeed, our results across different measures of student background and academic outcomes consistently show that test scores do not exhibit calibration bias against students from less advantaged backgrounds (see Appendix Table 1 and Appendix Figures 2 and 3).

C. Comparison with the Literature

A long literature has found a positive relationship between standardized test scores and academic performance in college (e.g., Fishman and Pasanella 1960, Morgan 1989, Bettinger, Evans and Pope 2013), college retention and completion (e.g., Mattern and Patterson 2009, 2011, Allensworth and Clark 2020) and early-career post-baccalaureate outcomes (Chetty, Deming and Friedman 2023). Our findings align with this literature.

A much smaller body of work has compared the predictive power of SAT/ACT scores to that of high school GPA or other measures of academic preparedness in a multiple regression framework, and this literature finds a more mixed set of results. For instance, Allensworth and Clark (2020) show that ACT scores have only marginally statistically significant power to predict the 6-year college graduation rates of students from Chicago Public Schools, while high school GPA has a much larger and more statistically significant effect. University of California, Office of the President (2020) show that both standardized test (SAT and ACT) scores and high school GPA increase explanatory power in regressions that predict first-year GPA at UC campuses, while Geiser and Santelices (2007) find that high school GPA outperforms standardized test scores in the UC system. Chetty, Deming and Friedman (2023) find that SAT/ACT scores, but not high school GPA, predicts early-career success.

One apparent pattern across these studies is that standardized test scores perform better in more selective college settings. Recent grade inflation could be eroding the information content of high school GPA most at the top, as more students are pushed up against the 4.0 cap. Goodman, Gurantz and Smith (2020) show that retaking SAT tests increases scores more for students lower in the test-score distribution. Finally, it may be that SAT/ACT tests and high school GPA simply capture different combinations of underlying student attributes that themselves are most relevant in different higher education situations; for instance, high school GPA in part captures variation in student attendance patterns, while test scores (by definition) measure scores for those students who are in attendance on the day of the test.

IV. Implications for Admissions Policy

These results show that SAT/ACT test scores possess important predictive power for students' academic performance in their first year of college at Ivy-Plus institutions. While some of the raw correlation between these variables relates to students' demographic characteristics, much remains even when controlling for these variables. In contrast, high school GPA does not predict academic performance nearly as well. We also find no evidence of bias against students from less advantaged backgrounds, as students from such backgrounds do not outperform (and in some cases underperform) other students with the same test score.

It is important to acknowledge that students from low-income families and other less advantaged backgrounds have lower standardized test scores and are less likely to take the test than students from higher income families. This fact is consistent with those presented above because of disparities experienced throughout childhood, including differences in school quality (Chetty et al. 2014), neighborhood exposure (Chetty et al. 2020), and many other environmental conditions. While our findings do not suggest how to address these deeper inequities, they do suggest that test scores may be helpful for highly selective colleges to gauge the academic preparation of their applicants, and in turn to create more upward mobility by prioritizing admissions for academically prepared students from a broader range of backgrounds.

Collectively, these results suggest that standardized test scores provide important information to measure applicants' academic preparation that is not available elsewhere in the application file. In practice, the current debate at most selective colleges is whether to maintain test-optional policies or returning to required testing. In addition to depriving admissions officers of valuable information on students' academic preparation, test-optional policies also may affect students' choices whether and how to apply. Additional results from Sacerdote, Staiger and Tine (2025) suggest that students from less advantaged backgrounds may be less well informed when making these decision, for instance by choosing to withhold their test scores when those scores would actually help their chances of admissions. As a result, admissions policies that require applicants to submit test scores may benefit less advantaged students in the application process.

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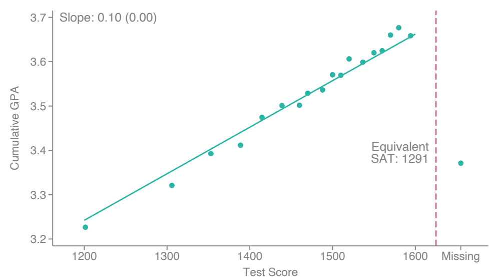
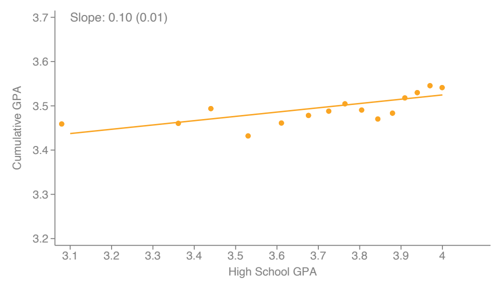
Figure 1 : First-Year Students' Performance by Test Score and High School GPA

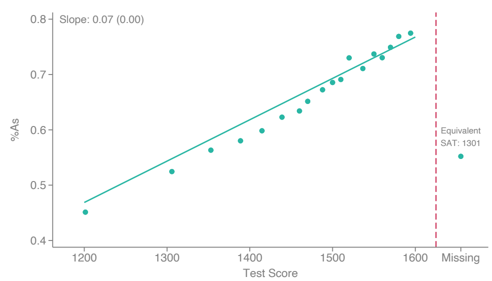
(a) Cumulative GPA by Test Score



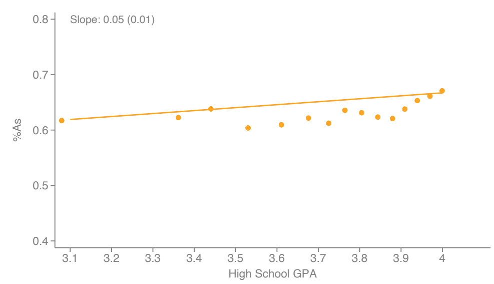
(b) Cumulative GPA by High School GPA



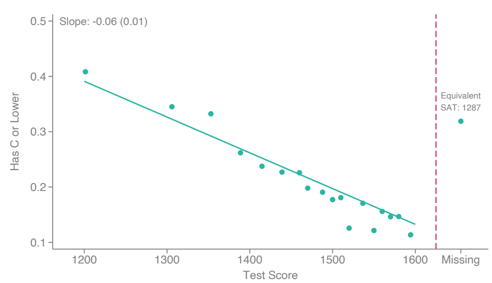
(c) Fraction of Grade A or A- by Test Score



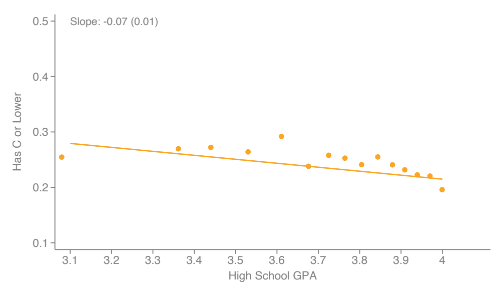
(d) Fraction of Grade A or A- by High School GPA



(e) Fraction of Students with C+ or Lower by Test Score



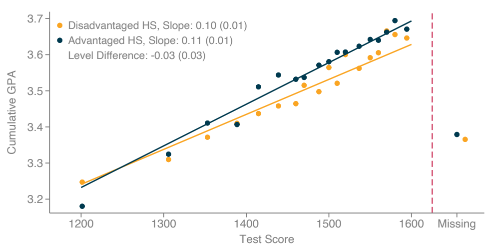
(f) Fraction of Students with C+ or Lower by High School GPA



Note: Figure 1 presents binned scatter plots of first-year academic performance vs. SAT/ACT test scores (Panels A, C, and E) or high school GPA (Panels B, D, and F) for students enrolled at selected Ivy-Plus colleges controlling for some students' characteristics. Panel A presents binned scatterplots of academic outcomes vs. SAT/ACT score in a specification that includes fixed effects for each school-by-year and for a student's race, gender, and parent income, as well as controls for other student demographics from admissions data. The specifications in Panels A, C, and E also control for high-school GPA; the specifications in Panels B, D, and F also control for SAT/ACT score and the indicator for missing score. The rightmost dots in Panels A, C and E respectively are for students who do not submit a test score when applying under a test-optional admissions regime. These specifications match those in Table 1, Panels A-C, Column (4).

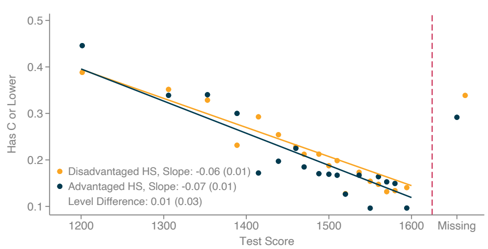
Figure 2 : First-Year Cumulative GPA and Fraction of Students with C+ or Lower by Test Score and Students' Characteristics

(a) First-Year Cumulative GPA By H.S. Landscape Score

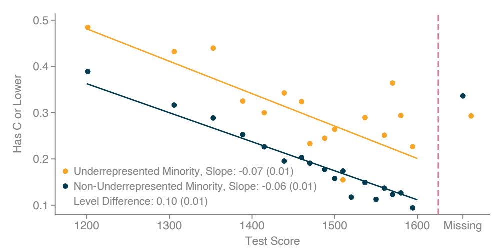


(b) First-Year Cumulative GPA By Underrepresented Minority Status

(c) Fraction of Students with C+ or Lower By H.S. Landscape Score



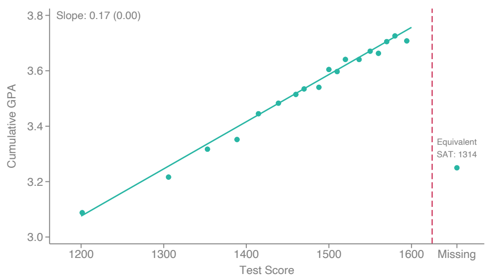
(d) Fraction of Students with C+ or Lower By Underrepresented Minority Status



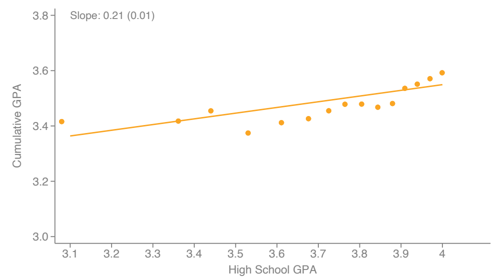
Note: Figure 2 replicates the binned scatter plot specification in Figure 1a, except that students are split based on their characteristics into two different series. In Panel A, we split students based on the challenge index for their high school; high schools with an index value above the 20th national percentile - roughly the top quartile of student applicants - are "less advantaged." In Panel B, we split students into those who are from historically underrepresented racial and ethnic groups and those who are not. The specifications in Panels A and B match those in Appendix Table 1, Panel A, Columns 1 and 4, respectively. Panels C and D replicate Panels A and B except using our indicator for academic struggle as the dependent variable; these specifications match those in Appendix Table 1, Panel C, Columns 1 and 4, respectively. The level effect reported in each panel is difference in outcomes between the groups for students with an SAT score of 1400.

Appendix Figure 1 : First-Year Students' Performance by Test Score and High School GPA (Without Other Controls)

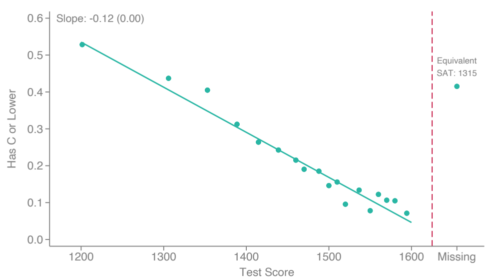
(a) Cumulative GPA by Test Score



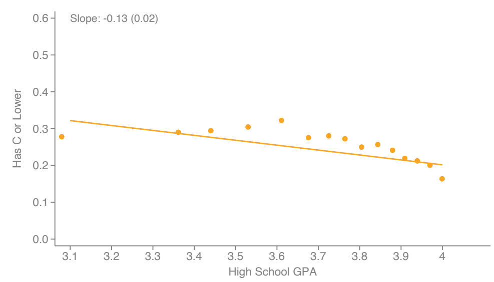
(b) Cumulative GPA by High School GPA



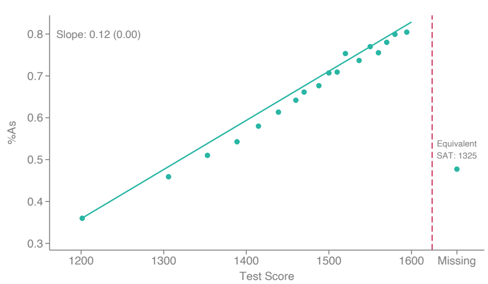
(c) Fraction of Students with C+ or Lower by Test Score



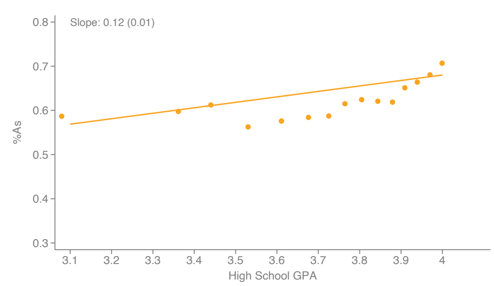
(d) Fraction of Students with C+ or Lower by High School GPA



(e) Fraction of Grade A or A- by Test Score



(f) Fraction of Grade A or A- by High School GPA



Note: Appendix Figure 1 presents binned scatter plots of first-year academic performance vs. SAT/ACT test scores or high school GPA for students enrolled at selected Ivy-Plus colleges. Panels A, C, and E present binned scatterplots of academic outcomes vs. SAT/ACT score in a specification that matches those in Appendix Table 1, Column (1). The rightmost dot is for students who do not submit a test score when applying under a test-optional admissions regime. Panels B, D, and F similarly present binned scatterplots that replicate the specification in Appendix Table 1, Column (2).

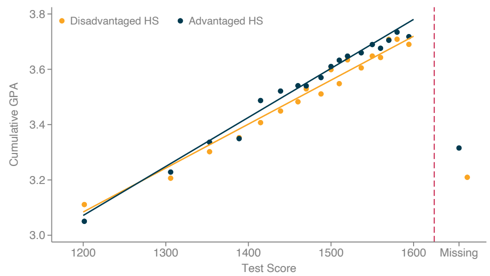
Table 1: Association Between Test Score and College Outcomes By Group

	(1)	(2)	(3)	(4)	(5)	(6)
Panel A: Cumulative GPA						
SAT	0.1702***		0.1663***	0.1050***	0.1056***	0.0988***
	(0.0037)		(0.0038)	(0.0046)	(0.0046)	(0.0066)
Missing SAT	-0.1458***		-0.1452***	-0.1140***	-0.1156***	-0.0802***
	(0.0119)		(0.0118)	(0.0118)	(0.0120)	(0.0171)
High School GPA		0.2061***	0.1051***	0.0969***	0.0961***	0.1536***
		(0.0150)	(0.0139)	(0.0139)	(0.0139)	(0.0216)
Admissions Controls	No	No	No	Yes	Yes	Yes
URM, Gender, Family Income	No	No	No	Yes	Yes	Yes
URM x Gender x Family Income	No	No	No	No	Yes	Yes
High School FEs	No	No	No	No	No	Yes
R2	0.186	0.047	0.189	0.227	0.230	0.622
Mean of Dep. Variable	3.503	3.503	3.503	3.503	3.503	3.503
Implied SAT with Performance Equal to Missing SAT	1314		1313	1291	1291	1319
Num of obs.	14620	14620	14620	14620	14620	14620
Panel B: %As						
SAT	0.1174***		0.1153***	0.0748***	0.0752***	0.0773***
	(0.0024)		(0.0024)	(0.0029)	(0.0030)	(0.0045)
Missing SAT	-0.0878***		-0.0873***	-0.0740***	-0.0739***	-0.0552***
	(0.0069)		(0.0069)	(0.0069)	(0.0069)	(0.0106)
High School GPA		0.1236***	0.0597***	0.0534***	0.0527***	0.0798***
		(0.0096)	(0.0087)	(0.0086)	(0.0086)	(0.0140)
Admissions Controls	No	No	No	Yes	Yes	Yes
URM, Gender, Family Income	No	No	No	Yes	Yes	Yes
URM x Gender x Family Income	No	No	No	No	Yes	Yes
High School FEs	No	No	No	No	No	Yes
R2	0.241	0.056	0.244	0.291	0.294	0.662
Mean of Dep. Variable	0.640	0.640	0.640	0.640	0.640	0.640
Implied SAT with Performance Equal to Missing SAT	1325		1324	1301	1302	1329
Num of obs.	11,975	11,975	11,975	11,975	11,975	11,975
Panel C: Has C+ or Below						
SAT	-0.1222***		-0.1198***	-0.0646***	-0.0632***	-0.0612***
	(0.0041)		(0.0041)	(0.0050)	(0.0051)	(0.0075)
Missing SAT	0.1033***		0.1029***	0.0727***	0.0790***	0.0376**
	(0.0116)		(0.0116)	(0.0117)	(0.0118)	(0.0178)
High School GPA		-0.1335***	-0.0662***	-0.0717***	-0.0707***	-0.1032***
		(0.0152)	(0.0146)	(0.0147)	(0.0147)	(0.0236)
Admissions Controls	No	No	No	Yes	Yes	Yes
URM, Gender, Family Income	No	No	No	Yes	Yes	Yes
URM x Gender x Family Income	No	No	No	No	Yes	Yes
High School FEs	No	No	No	No	No	Yes
R2	0.100	0.013	0.101	0.137	0.139	0.599
Mean of Dep. Variable	0.235	0.235	0.235	0.235	0.235	0.235
Implied SAT with Performance Equal to Missing SAT	1315		1314	1287	1275	1339
Num of obs.	11,975	11,975	11,975	11,975	11,975	11,975

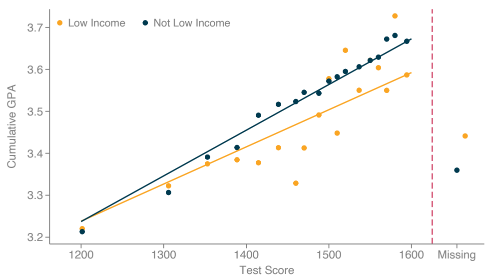
Note: This table presents regression of academic performance during a student's first year on their test scores and high school GPA. The dependent variable for panel A is the cumulative GPA a student received in their first year; for panel B it is the fraction of courses in the first year with A or A- year; for Panel C it is an indicator equal to 1 if a student ever received a grade of C+ or lower in their first year. All columns control for school and year fixed effects. Admissions controls include legacy status, athletic recruit status, first-generation college status, rural/urban home, U.S. citizen or permanent resident, and high school challenge index. Column (4) additionally includes fixed effects for a student's gender, URM status (if a student self-identifies as Black, Hispanic, American Indian and Alaskan Native, or Native Hawaiian and Pacific Islander), and family income terciles (for those who applied for financial aid, with an additional indicator for applying for financial aid). Column (5) interacts these three fixed effects; column 6 instead includes high school fixed effects. Test scores are normed to 0 for students with an SAT scores of 1400 (ACT score of 31) and divided by 100. Samples are students started school in 2017, 2018, 2019, 2021, 2022, and 2023 (although Panels B and C exclude the 2019 cohort).

Appendix Figure 2 : First-Year Cumulative GPA by Test Score and Students' Characteristics

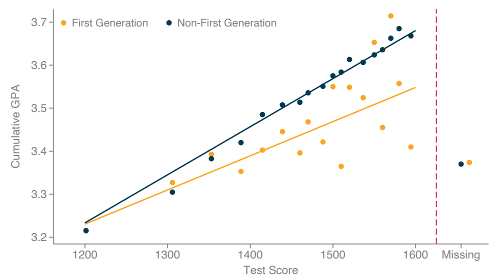
(a) By High School Landscape Score (Raw)



(b) By Parental Income (with Controls)



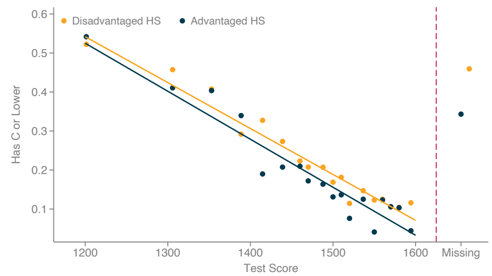
(c) By First Generation Status (with Controls)



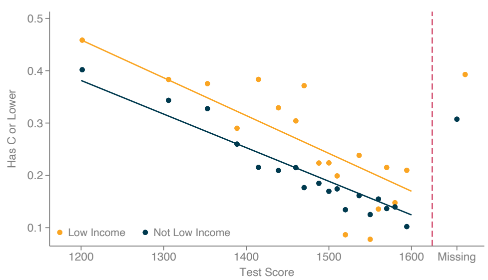
Note: Appendix Figure 2 presents binned scatter plots of first-year cumulative GPA vs. SAT/ACT test scores for students enrolled at selected Ivy-Plus colleges by students' characteristics. Panel A presents a binscatter splitting students on a measure of high school challenge index to replicate the specification in Appendix Table 1, Panel A, Column (1), except including only school and year fixed effects as controls. Panel B presents the same split binscatter with additional controls, matching the specification in Appendix Table 1, Panel A, Column (1). Panels C and D replicate Figure 2 but splitting on other student characteristics, matching the specifications in Appendix Table 1, Panel A, Columns 2 and 3.

Appendix Figure 3 : Fraction of First-Year Students with C+ or Lower by Test Score and Students' Characteristics

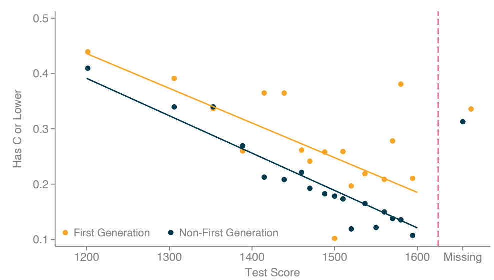
(a) By High School Landscape Score (Raw)



(b) By Parental Income (with Controls)



(c) By First Generation Status (with Controls)



Note: Appendix Figure 3 presents binned scatter plots of fraction of first-year students with C+ or lower vs. SAT/ACT test scores for students enrolled at selected Ivy-Plus colleges by students' characteristics. Panel A presents a binscatter splitting students on a measure of high school challenge index to replicate the specification in Appendix Table 1, Panel C, Column 1, except including only school and year fixed effects as controls. Panel B presents a similar split binscatter, splitting on parent income and including additional controls, matching the specification in Appendix Table 1, Panel C, Column (2). Panel C replicates Appendix Figure 3b but splitting on first generation status, matching the specification in Appendix Table 1, Panel C, Column (3).

Appendix Table 1: Association Between Test Score and College Outcomes By Group

	(1)	(2)	(3)	(4)
Panel A: Cumulative GPA				
Cut Variable	-0.0281	-0.0397***	-0.0676***	-0.1068***
	(0.0262)	(0.0135)	(0.0133)	(0.0108)
SAT Slope For Cut = 1	0.0969***	0.0885***	0.0794***	0.1043***
	(0.0058)	(0.0088)	(0.0102)	(0.0077)
SAT Slope For Cut = 0	0.1153***	0.1089***	0.1118***	0.1076***
	(0.0062)	(0.0050)	(0.0049)	(0.0055)
Missing SAT For Cut = 1	-0.1321***	-0.0767***	-0.1604***	-0.1390***
	(0.0149)	(0.0284)	(0.0211)	(0.0175)
Missing SAT For Cut = 0	-0.0845***	-0.1166***	-0.0918***	-0.0951***
	(0.0176)	(0.0127)	(0.0136)	(0.0151)
Cut Variable	Less Advantaged HS	Bottom Quintile Family Income Among Applicants	First Generation	Underrepresented Minority
R2	0.228	0.228	0.228	0.228
Mean of Dep. Variable	3.503	3.503	3.503	3.503
Implied Gap at SAT = 1300	-0.010	-0.019	-0.035	-0.103
Implied Gap at SAT = 1500	-0.047	-0.060	-0.100	-0.110
Num of obs.	14,620	14,620	14,620	14,620
Panel B: %As				
Cut Variable	0.0017	-0.0170*	-0.0367***	-0.0595***
	(0.0170)	(0.0089)	(0.0086)	(0.0070)
SAT Slope For Cut = 1	0.0670***	0.0651***	0.0594***	0.0621***
	(0.0037)	(0.0057)	(0.0066)	(0.0050)
SAT Slope For Cut = 0	0.0848***	0.0774***	0.0785***	0.0819***
	(0.0040)	(0.0032)	(0.0032)	(0.0035)
Missing SAT For Cut = 1	-0.0852***	-0.0783***	-0.0921***	-0.0856***
	(0.0087)	(0.0167)	(0.0126)	(0.0103)
Missing SAT For Cut = 0	-0.0550***	-0.0713***	-0.0649***	-0.0605***
	(0.0103)	(0.0074)	(0.0079)	(0.0088)
Cut Variable	Less Advantaged HS	Bottom Quintile Family Income Among Applicants	First Generation	Underrepresented Minority
R2	0.292	0.291	0.291	0.292
Mean of Dep. Variable	0.640	0.640	0.640	0.640
Implied Gap at SAT = 1300	0.020	-0.005	-0.018	-0.040
Implied Gap at SAT = 1500	-0.016	-0.029	-0.056	-0.079
Num of obs.	11,975	11,975	11,975	11,975
Panel C: Has C+ or Below				
Cut Variable	0.0124	0.0613***	0.0545***	0.1040***
	(0.0290)	(0.0151)	(0.0146)	(0.0119)
SAT Slope For Cut = 1	-0.0625***	-0.0723***	-0.0627***	-0.0701***
	(0.0063)	(0.0097)	(0.0113)	(0.0085)
SAT Slope For Cut = 0	-0.0691***	-0.0642***	-0.0676***	-0.0628***
	(0.0068)	(0.0055)	(0.0054)	(0.0060)
Missing SAT For Cut = 1	0.0999***	0.1686***	0.1245***	0.0791***
	(0.0149)	(0.0285)	(0.0215)	(0.0176)
Missing SAT For Cut = 0	0.0338*	0.0588***	0.0534***	0.0703***
	(0.0175)	(0.0126)	(0.0135)	(0.0150)
Cut Variable	Less Advantaged HS	Bottom Quintile Family Income Among Applicants	First Generation	Underrepresented Minority
R2	0.137	0.138	0.137	0.137
Mean of Dep. Variable	0.235	0.235	0.235	0.235
Implied Gap at SAT = 1300	0.006	0.069	0.050	0.111
Implied Gap at SAT = 1500	0.019	0.053	0.059	0.097
Num of obs.	11,975	11,975	11,975	11,975

Note: This table replicates Table 1, Column (4), except that each separately estimates the relationship between test scores and academic outcomes for two "cuts" of students. In Column (1), students are split based on the challenge index for the high school each student attended; high schools with an index value above the 20th national percentile are "less advantaged." Column (2) separately estimates the relationship for students in the bottom quintile of family income. Column (3) separately estimates the relationship for first-generation college students. Column (4) separately estimates the relationship for underrepresented minority students; thus, the specifications in Column (4) do not control for underrepresented minority status. See notes to Appendix Table 1 for additional detail.