

ONLINE APPENDIX

for

”Standardized Test Scores and Academic Performance at Ivy-Plus Colleges”

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A1. Data and Variable Definitions

This appendix provides additional details on our data variable definitions.

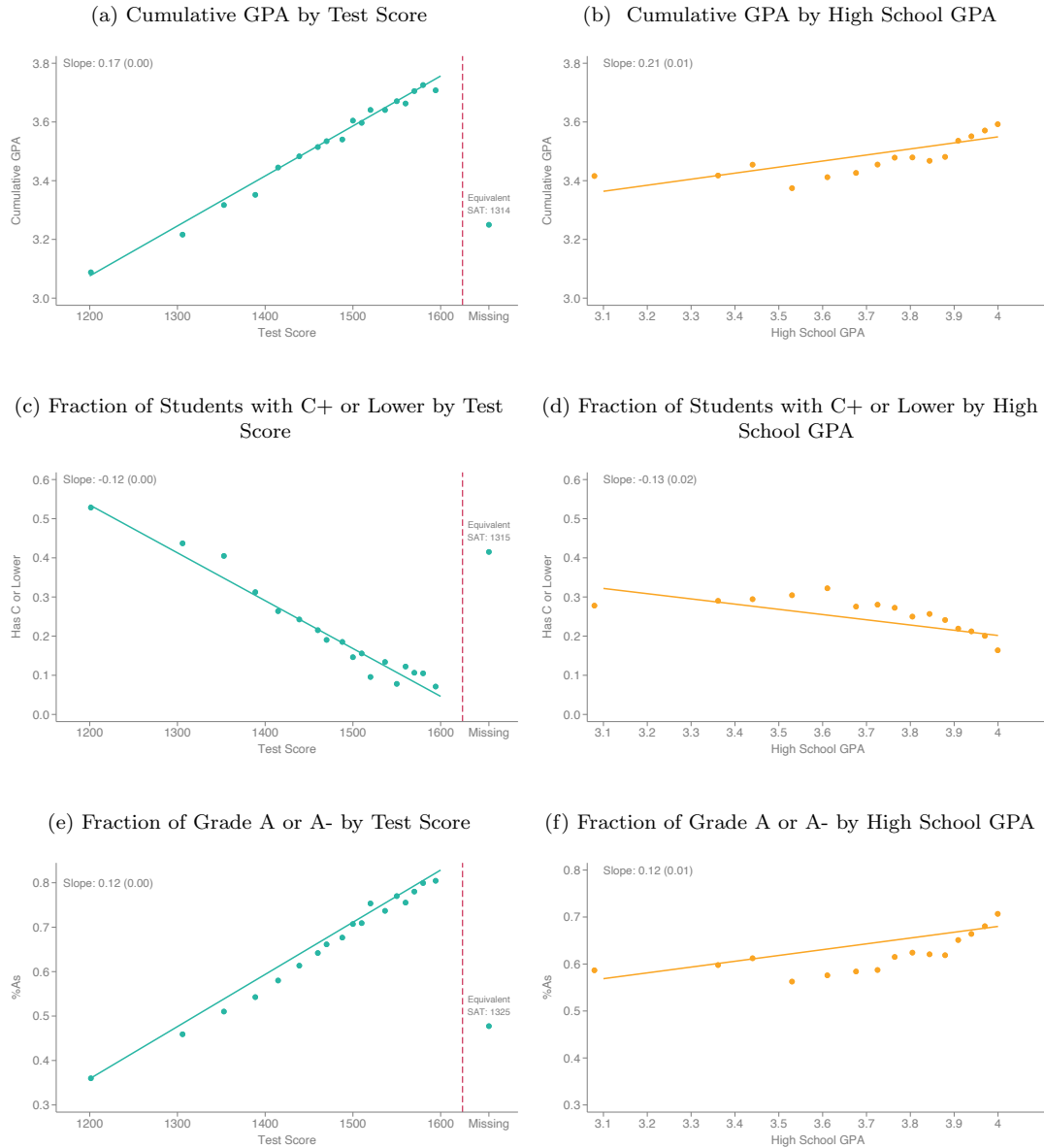
We denote standardized test scores using the SAT Composite scale (which sums the score on the Math exam and the Evidence Based Reading and Writing exam) from 400 to 1600. When students submit ACT but not SAT scores, we take the composite ACT score and then convert it to the SAT’s scale using scale equivalence 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 measure weighted high school GPA on the standard 4.0 scale, in which a D is a 1.0 and an A is a 4.0. 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 measure various other student characteristics 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 groups (i.e., HUG) if a student self-identifies as Black, Hispanic, American Indian or Alaskan Native, or Native Hawaiian or Other 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 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 but do not report 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 advantage 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. 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 these alternative performance measures of academic struggle or the percent of grades that are As as the dependent variable.

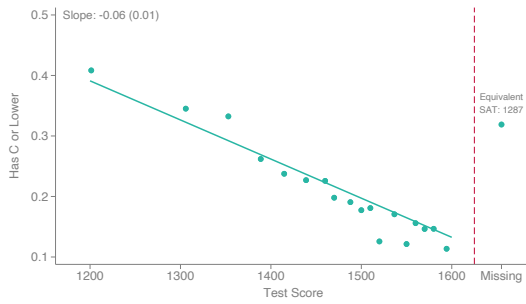
Appendix Figure 1 : First-Year Students' Performance by Test Score and High School GPA (Without Other Controls)



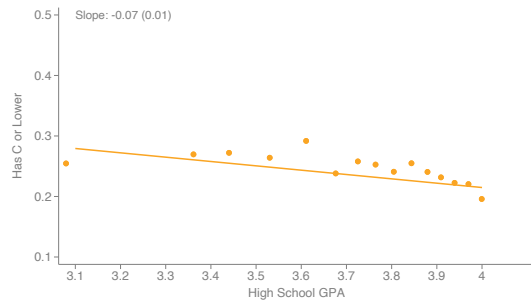
Note: Appendix Figure 1 presents binned scatter plots of first-year academic performance vs. SAT/ACT test scores or high school GPA for students enrolled at selected Ivy-Plus colleges. Panels A, C, and E present binned scatterplots of academic outcomes vs. SAT/ACT score in a specification that matches 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.

Appendix Figure 2 : First-Year Students' Performance by Test Score and High School GPA Conditional on Students' Characteristics

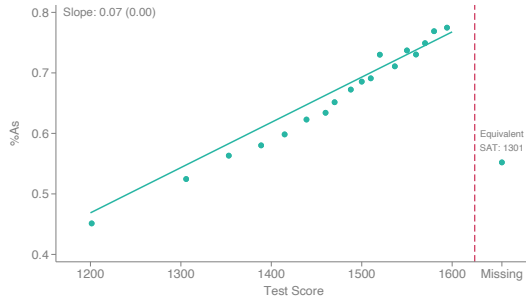
(a) Fraction of Students with C+ or Lower by Test Score



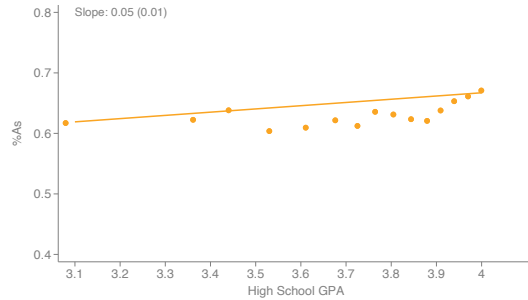
(b) Fraction of Students with C+ or Lower by High School GPA



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

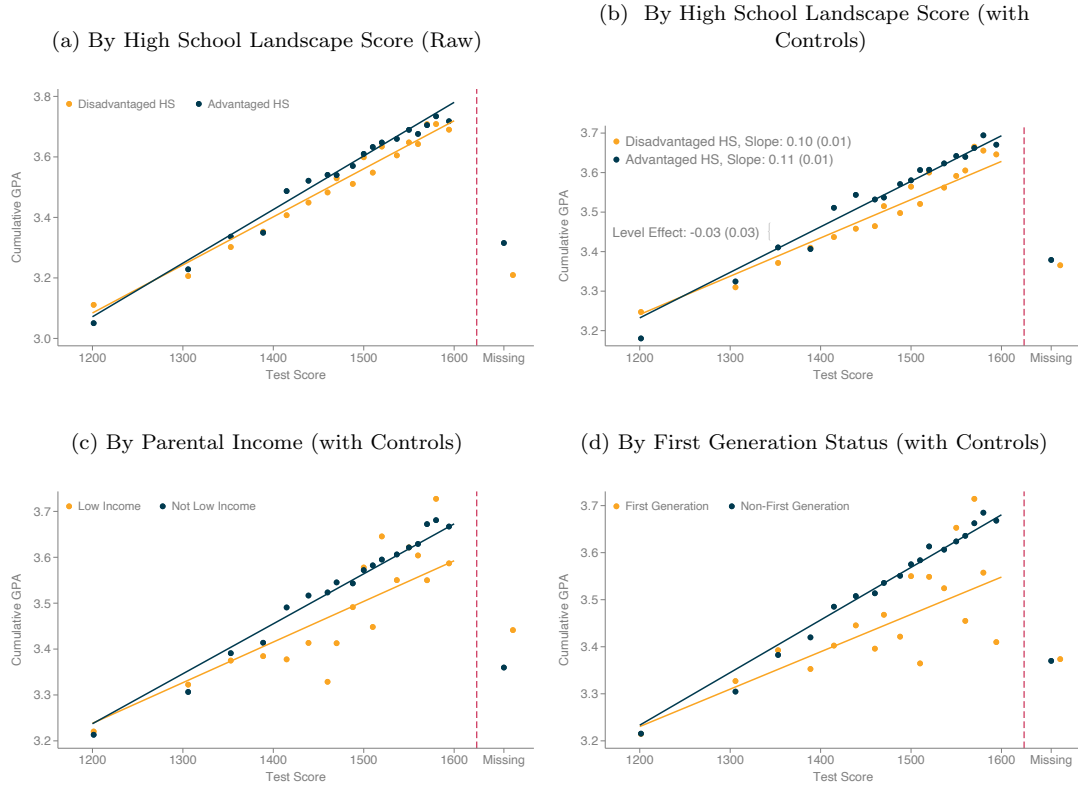


(d) Fraction of Grade A or A- by High School GPA



Note: Appendix Figure 2 presents binned scatter plots of first-year academic performance vs. ACT/SAT test scores or high school GPA for students enrolled at selected Ivy-Plus colleges controlling for some students' characteristics. Panels A and C present binned scatterplots of academic outcomes vs. SAT/ACT score in a specification that matches those in Appendix Table 1 Column 4. The rightmost dot is for students who do not submit a test score when applying under a test-optional admissions regime. Panels B and D similarly present binned scatterplots that replicate the specification in Appendix Table 1 Column 4 for High School GPA variable.

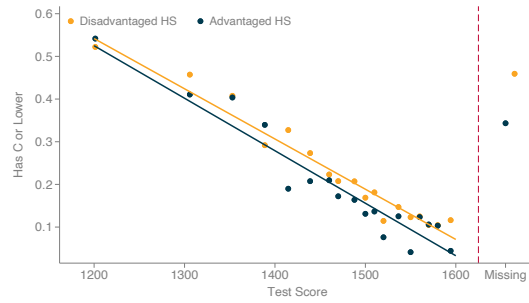
Appendix Figure 3 : First-Year Cumulative GPA by Test Score and Students' Characteristics



Note: Appendix Figure 3 presents binned scatter plots of first-year cumulative GPA vs. ACT/SAT 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 2 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 2 Panel A Column 1. Panels C and D replicate Appendix Figure 3b but splitting on other student characteristics, matching the specifications in Appendix Table 2 Panel A Columns 2 and 3.

Appendix Figure 4 : Fraction of First-Year Students with C+ or Lower by Test Score and Students' Characteristics

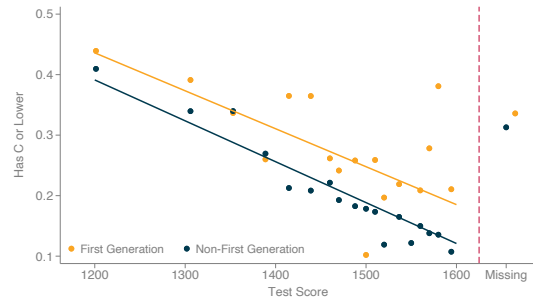
(a) By High School Landscape Score (Raw)



(b) By Parental Income (with Controls)



(c) By First Generation Status (with Controls)



Note: Appendix Figure 4 presents binned scatter plots of fraction of first-year students with C+ or lower vs. ACT/SAT 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 2 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 2 Panel C Column 2. Panel C replicates Appendix Figure 4b but splitting on first generation status, matching the specification in Appendix Table 2 Panel C Column 3.

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

	(1)	(2)	(3)	(4)	(5)	(6)
<i>Panel A: Cumulative GPA</i>						
SAT	0.1702*** (0.0037)		0.1663*** (0.0038)	0.1050*** (0.0046)	0.1056*** (0.0046)	0.0988*** (0.0066)
Missing SAT	-0.1458*** (0.0119)		-0.1452*** (0.0118)	-0.1140*** (0.0118)	-0.1156*** (0.0120)	-0.0802*** (0.0171)
High School GPA		0.2061*** (0.0150)	0.1051*** (0.0139)	0.0969*** (0.0139)	0.0961*** (0.0139)	0.1536*** (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 Performace	1314		1313	1291	1291	1319
Equal to Missing SAT						
Num of obs.	14620	14620	14620	14620	14620	14620
<i>Panel B: %As</i>						
SAT	0.1174*** (0.0024)		0.1153*** (0.0024)	0.0748*** (0.0029)	0.0752*** (0.0030)	0.0773*** (0.0045)
Missing SAT	-0.0878*** (0.0069)		-0.0873*** (0.0069)	-0.0740*** (0.0069)	-0.0739*** (0.0069)	-0.0552*** (0.0106)
High School GPA		0.1236*** (0.0096)	0.0597*** (0.0087)	0.0534*** (0.0086)	0.0527*** (0.0086)	0.0798*** (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 Performace	1325		1324	1301	1302	1329
Equal to Missing SAT						
Num of obs.	11,975	11,975	11,975	11,975	11,975	11,975
<i>Panel C: Has C or Below</i>						
SAT	-0.1222*** (0.0041)		-0.1198*** (0.0041)	-0.0646*** (0.0050)	-0.0632*** (0.0051)	-0.0612*** (0.0075)
Missing SAT	0.1033*** (0.0116)		0.1029*** (0.0116)	0.0727*** (0.0117)	0.0790*** (0.0118)	0.0376*** (0.0178)
High School GPA		-0.1335*** (0.0152)	-0.0662*** (0.0146)	-0.0717*** (0.0147)	-0.0707*** (0.0147)	-0.1032*** (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 Performace	1315		1314	1287	1275	1339
Equal to Missing SAT						
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 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 (although Panels B and C exclude the 2019 cohort).

Appendix Table 2: Association Between Test Score and College Outcomes By Group

	(1)	(2)	(3)	(4)
<i>Panel A: Cumulative GPA</i>				
Cut Variable	-0.0281 (0.0262)	-0.0397*** (0.0135)	-0.0676*** (0.0133)	-0.1068*** (0.0108)
SAT Slope For Cut = 1	0.0969*** (0.0058)	0.0885*** (0.0088)	0.0794*** (0.0102)	0.1043*** (0.0077)
SAT Slope For Cut = 0	0.1153*** (0.0062)	0.1089*** (0.0050)	0.1118*** (0.0049)	0.1076*** (0.0055)
Missing SAT For Cut = 1	-0.1321*** (0.0149)	-0.0767*** (0.0284)	-0.1604*** (0.0211)	-0.1390*** (0.0175)
Missing SAT For Cut = 0	-0.0845*** (0.0176)	-0.1166*** (0.0127)	-0.0918*** (0.0136)	-0.0951*** (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
<i>Panel B: %As</i>				
Cut Variable	0.0017 (0.0170)	-0.0170* (0.0089)	-0.0367*** (0.0086)	-0.0595*** (0.0070)
SAT Slope For Cut = 1	0.0670*** (0.0037)	0.0651*** (0.0057)	0.0594*** (0.0066)	0.0621*** (0.0050)
SAT Slope For Cut = 0	0.0848*** (0.0040)	0.0774*** (0.0032)	0.0785*** (0.0032)	0.0819*** (0.0035)
Missing SAT For Cut = 1	-0.0852*** (0.0087)	-0.0783*** (0.0167)	-0.0921*** (0.0126)	-0.0856*** (0.0103)
Missing SAT For Cut = 0	-0.0550*** (0.0103)	-0.0713*** (0.0074)	-0.0649*** (0.0079)	-0.0605*** (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
<i>Panel C: Has C or Below</i>				
Cut Variable	0.0124 (0.0290)	0.0613*** (0.0151)	0.0545*** (0.0146)	0.1040*** (0.0119)
SAT Slope For Cut = 1	-0.0625*** (0.0063)	-0.0723*** (0.0097)	-0.0627*** (0.0113)	-0.0701*** (0.0085)
SAT Slope For Cut = 0	-0.0691*** (0.0068)	-0.0642*** (0.0055)	-0.0676*** (0.0054)	-0.0628*** (0.0060)
Missing SAT For Cut = 1	0.0999*** (0.0149)	0.1686*** (0.0285)	0.1245*** (0.0215)	0.0791*** (0.0176)
Missing SAT For Cut = 0	0.0338* (0.0175)	0.0588*** (0.0126)	0.0534*** (0.0135)	0.0703*** (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 Appendix 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.