The Frog Pond Revisited: High School Academic Context, Class Rank, and Elite College Admission

Thomas J. Espenshade
Princeton University

Lauren E. Hale
State University of New York, Stony Brook

Chang Y. Chung
Princeton University

In this article, the authors test a "frog-pond" model of elite college admission proposed by Attewell, operationalizing high school academic context as the secondary school-average SAT score and number of Advanced Placement tests per high school senior. Data on more than 45,000 applications to three elite universities show that a high school's academic environment has a negative effect on college admission, controlling for individual students' scholastic ability. A given applicant's chances of being accepted are reduced if he or she comes from a high school with relatively more highly talented students, that is, if the applicant is a small frog in a big pond. Direct evidence on high school class rank produces similar findings. A school's reputation or prestige has a counterbalancing positive effect on college admission. Institutional gatekeepers are susceptible to context effects, but the influence of school variables is small relative to the characteristics of individual students. The authors tie the findings to prior work on meritocracy in college admission and to the role played by elite education in promoting opportunity or reproducing inequality, and they speculate on the applicability of frog-pond models in areas beyond elite college admission.

Frog-pond effects are typically studied in instances in which a social comparison dynamic is presumed to influence individual behaviors. In a classic article, Davis (1966) examined the career decisions of college-age men. He found that on a given campus, students who had higher grade point averages (GPAs) were more likely to opt for elite careers. However, when students' scholastic aptitude was controlled and school quality varied, a given student was *less* likely to select a high-performance career field the more competitive his college academic environment was. Davis cautioned parents who were sending their sons to college: "It is better to be a big frog in a small pond than a small frog in a big pond" (p. 31). Marsh and his colleagues (Marsh 1991; Marsh et al. 1995; Marsh, Köller, and Baumert 2001; Marsh, Kong, and Hau 2000; Marsh and Parker 1984) found a similar pattern of results when linking individual-student and school-average achievement levels to academic self-concept, educational and occupational aspirations, and the likelihood of attending college.

The frog-pond model helps to explain how the nation's 3 million high school graduates get sorted among alternative college and noncollege destinations. Class rank, along with self-selection by students; individual academic performance; parents' education and socioeconomic status; and the gatekeeping roles of peers, schools, teachers, and guidance counselors, is an important determinant of whether to apply to college, how many to apply to, and which ones (Hossler, Schmit, and Vesper 1999; Manski and Wise 1983; McDonough 1997).

Colleges and universities, especially the most selective ones, also exercise gatekeeping functions. In deciding which students to admit, admission officers evaluate applicants with an eye toward assembling a first-year class that best matches institutional priorities and objectives (Bowen and Bok 1998; Duffy and Goldberg 1998). Studies of factors that affect admission outcomes usually concentrate on the characteristics of individual students, including academic performance, sex, race and ethnicity, athletic ability, and legacy status (Bowen and Bok 1998; Bowen and Levin 2003; Espenshade, Chung, and Walling 2004; Kane 1998; Karen 1990, 1991; Shulman and Bowen 2001). Rarely has a secondary school's academic environment received serious attention. Some research has included controls for high school sample stratum (Kane 1998) or for the type of school (public, parochial, or private). Private schools, especially elite boarding schools, have more success than do public high schools in placing students at the most academically selective institutions (Cookson and Persell 1985). Lillard and Gerner (1999) included indicators for the percentage of a high school's class who go to college and whether the high school is in an urban setting, but these contextual measures were treated as control variables and were not featured in the analysis.

Attewell (2001) introduced high school context effects into studies of selective college admissions. He argued that admission officers at Ivy League and other elite colleges and universities use an Academic Index (AI) to summarize the scholastic competence and potential of applicants. The AI is made up of three equal parts: a student's SAT I score, average scores on the SAT II or achievement tests, and percentile class rank. Because of the important role that class rank plays, students with very good grades and strong test scores at talent-rich high schools are at a competitive disadvantage relative to their even-more-gifted peers. Unless these students are at the top of their class, they are more likely to gain acceptance to selective colleges and universities if they attend a less prestigious high school.

Attewell (2001) developed his conclusions from simulations that were based on correlations between AI values and reported probabilities of admission to Dartmouth College. One objective of this article is to reexamine Attewell's conclusions with the aid of actual data on college applications and their outcomes. Our central question is this: Apart from a student's academic ability and other personal characteristics, do the chances of being admitted to an elite university depend on where an applicant goes to high school, that is, on the high school's academic environment?

HYPOTHESES

We expect the following five outcomes with respect to the role played by high school academic context in decisions on admission to elite colleges:

> *Hypothesis 1:* If two students come from the same or comparable high schools and if their demographic and other social characteristics are equivalent, there is a positive association between a student's academic merit and the probability of admission.

Academic ability is such a vital component in admission to elite colleges and universities that a student is unlikely to be accepted if admission officers have serious reservations about his or her ability to perform in the classroom. This does not mean that admission deans are searching only for applicants who score 1600 on the SAT test, but it does suggest that there is a scholastic floor below which applicants will not be admitted (Karen 1991). We therefore expect that, other things being equal, students who display stronger academic credentials will have a higher probability of being accepted.

> *Hypothesis 2:* Without screening on information about individual students' scholastic abilities, applicants from "better" high schools stand a greater chance of being admitted.

Some of the more prestigious high schools go to great lengths to burnish their reputations in the eyes of college admission deans. As Attewell (2001:279–80) noted, "They do so in the belief that a student's success in gaining entry to a selective college is not simply a matter of the candidate's personal achievements, but also reflects the scholarly reputation and rigor of the high school she or he is graduating from." Colleges and universities respond by deploying admission officers to these elite secondary schools, by cultivating relationships with high school college counselors, and by encouraging a feeder system between particular secondary schools and elite colleges (Cookson and Persell 1985; Yaqub 2002). The close relationships that develop between elite colleges and similarly elite secondary schools were illustrated by Cookson and Persell (1985:181), who described instances in which college counselors from prestigious preparatory schools are invited to sit in on meetings of college admission committees. College admission offices are engaged, then, in a kind of "academic profiling" in which certain high schools are favored over others on the basis of their reputations for producing highly qualified students.

> *Hypothesis 3:* If two students are equivalent in terms of individual academic merit and other social characteristics, the one from the more academically competitive high school has a smaller chance of being admitted to an elite college or university.

We hypothesize that institutional gatekeepers are susceptible to the effects of high school context. This hypothesis parallels findings by Davis (1966) and by Marsh and colleagues, cited earlier, that there is a negative effect of school-average achievement levels on occupational choice and academic self-concept, when individual students' achievement is controlled. But here, following Attewell's (2001) work, we conjecture that frog-pond effects also work at the receiving end, where selective college admission officers must admit a relatively small number of students from a large pool of highly qualified applicants. Testing the frog-pond model of admission outcomes is the most important objective of this article. We hypothesize that with regard to acceptance at an elite college, it is more advantageous to be the strongest student in a less prestigious high school than an average student in an outstanding high school.

> *Hypothesis 4:* The negative effect of school-average achievement levels in Hypothesis 3 will be smaller for more academically talented students.

Attewell's (2001) simulations imply that the size of the negative effect of high school academic context varies with the ability level of the student. As Attewell noted, "Students at the top of star schools are not penalized by the class-rank emphasis. But students who are just below the top find that their SAT scores are 'worth' much less . . . than if they received the same SAT scores and GPAs while attending a less selective high school" (p. 277). Marsh and Hau (2003) and Marsh et al. (2001) examined the effect of an interaction between school-average ability and individual students' ability on academic self-concept and concluded that it is small. We expect that an interaction between individual students' achievement levels and school-average achievement levels will be positive.

> *Hypothesis 5:* Information about high schools' academic environment makes a statistically significant contribution to our understanding of elite college admissions, net of other factors.

Several authors have reported that high

school contextual effects are typically "small" or "modest" in relation to the importance of individual students' attributes (Alexander and Eckland 1975, 1977; Hauser, Sewell, and Alwin 1976). Theory alone cannot tell us whether to expect that the effects of a secondary school's academic environment will be large or small. But our results would stand in contrast to a large literature if school effects, as perceived by college admission deans, outweighed the importance of applicants' social and academic characteristics. We expect to find that high school academic context is statistically significant when added to models that include individual students' attributes. We also expect that the impact of such institutional variables will be small in relation to students' academic and nonacademic merit.

DATA AND METHODS

We used data from the National Study of College Experience (NSCE), a collaborative study involving 10 academically selective colleges and universities for the purpose of gaining a better understanding of the paths that students follow through higher education. The 10 institutions are a subset of the 34 schools in the College and Beyond database (Bowen and Bok 1998). They contain geographic spread and represent public universities, private research universities, and small liberal arts colleges.[1] Each school was asked to supply information on all individual students who applied for admission in 1983, 1993, and 1997. This information included personal identifiers, whether the student was accepted, other data from the application form, and supplemental data from the offices of financial aid and the registrar if the applicant subsequently enrolled at that institution. In constructing the data set, we worked backward from elite colleges to applicants. Even though the analysis sample is a highly unrepresentative sample of all high school students who applied to college, the data are appropriate for analyzing the nature of elite college admissions.

Information on Students

For the purposes of this analysis, we used data from fall 1997 for three highly selective private research universities that represent the top tier of American higher education. SAT I scores average almost 1400 for entering freshmen. Data from these institutional records included the applicant's sex, race, citizenship, athletic and legacy status, SAT I scores, secondary school attended, and place of permanent residence. Academic ability is usually considered sufficiently multidimensional that no single measure adequately captures it. Initially, we considered two measures of individual students' academic achievement: the combined score on the SAT I math and verbal tests and the number of Advanced Placement (AP) tests an applicant had taken. These data were obtained from the Educational Testing Service (ETS).

SAT score is a much-used measure of scholastic ability. Students can also signal their academic aptitude to elite colleges by taking a large number of AP examinations (Attewell 2001). Students who take AP courses earn higher grades in college, major in more difficult subject areas, drop out of college at lower rates, and are more likely to seek graduate and professional degrees than are students who do not take AP classes (Curry, MacDonald, and Morgan 1999; Santoli 2002). Not only is there an advantage in college acceptance from having AP courses on the high school transcript, but it is the number and subject areas of the courses, rather than the grades received on the AP examinations, that matter most to admission deans (Santoli 2002).

Contextual Variables

We included two indicators of high school academic environment in our analyses. By using multiple measures, we had greater confidence that we would capture what is most significant about the academic strength of high schools and that our findings would be more robust if both indicators were related to admission outcomes in the same way. The first school-level variable was high school average SAT score. The College Board provided the 1997 SAT I mean score for each secondary school, calculated from the latest scores of college-bound seniors.

The second measure of high school academic context was the number of AP tests taken per high school senior (Mathews 1998). This ratio is high when a large proportion of students takes AP tests and when the number of tests taken per student is large. Experienced admission officers suggest that elite colleges often rely on the number of AP courses a high school offers as an indicator of the rigor of the curriculum (Toor 2001). The numerator of this ratio is based on ETS data on the total number of AP tests that were taken at each high school in the 1996–97 academic year. The denominator is the size of the 12th-grade class in 1996–97. Data on the number of seniors in public schools came from the Common Core of Data, which were obtained from the National Center for Education Statistics (NCES). NCES's Private School Universe Survey contains comparable data for private schools.

We used two additional high school contextual variables. One is type of school (public, private, or religious), which is contained in data from the Student Descriptive Questionnaire (SDQ) that we acquired from ETS. A measure of a high school's academic reputation is also important. We asked seasoned admission officers at an Ivy League university to identify what they considered to be the "top U.S. secondary schools." Their recommendations included both large and small private and public schools. We grouped their suggestions into a list of 72 elite secondary schools—ones that would be considered by knowledgeable observers to be among the nation's best.

Descriptive information on the social and academic characteristics of the 45,549 applicants in our analysis file is presented in Table 1.[2] These three highly selective universities received an average of more than 15,000 applications for fall 1997. Slightly more than half the applicants were male; whites made up the largest applicant pool, followed by Asian students; most applicants were U.S. citizens; and only small proportions were athletes or legacies. The average acceptance rate in 1997 was just over 20 percent, meaning that these three institutions are among the most selective in the United States. Acceptance rates by category are shown in the second column of Table 1. Among the major racial/ethnic groups, admission rates were the highest for blacks, followed by Hispanics, and the lowest for Asians. Athletes and legacies were accepted at rates that were more than double those for the typical student.

The SAT score distribution for these applicants is shown in the second panel of Table 1. Two percent of the students had combined SAT scores that were below 1000. Most students had test scores that were well above 1300, and SAT scores overall averaged 1344. Because the average combined SAT I score for all SAT takers in 1997 was 1016, one sees how gifted the applicant pool was (College Board 2003). The chances of being admitted rose monotonically with each 100-point increase in SAT scores. But even in the highest SAT category (1500 and above), more than half the applicants were denied admission. Table 1 also shows the number of AP tests that these applicants took. Nearly one third of the sample, and almost 40 percent of the cases in which the number of tests is known, took fewer than three AP tests. Most students who took relatively few AP examinations in all likelihood attended high schools that did not offer many AP classes. Selective colleges and universities look unfavorably on applicants who could have taken AP courses and chose not to (Santoli 2002). Nearly 7 percent of the applicants took eight or more AP tests. These students were twice as likely to be admitted to the three universities in 1997 as were those with fewer than three AP tests.

Table 2 contains data on the characteristics of the applicants' high schools. Nearly 60 percent of the applications received by the three universities in our study came from students who attended public high schools. Another sixth were from applicants at private, nonreligious institutions. Students who attend private schools have a somewhat better chance of being admitted to an elite university than have applicants from other kinds of secondary schools. Roughly 1 out of every 12 applications came from a candidate at one of the 72 elite secondary schools in our sample.

Table 1. Students' Personal Characteristics and Academic Performance and Percentage of Applicants Admitted: Fall 1997

Category	Percentage of Applicants	Percentage Admitted
Total Sample (*N* = 45,549)	100.0	21.9
Students' Personal Characteristics		
Sex		
Male	52.1	21.2
Female	47.9	22.8
Race		
White	49.0	23.5
Black	5.9	33.6
Hispanic	6.5	26.7
Asian	29.8	17.6
Other	4.1	24.6
Unknown	4.7	9.6
Citizenship		
U.S.	83.9	23.2
Non-U.S.	16.1	15.2
Athlete		
No	95.5	20.6
Yes	4.6	49.3
Legacy		
No	96.9	21.2
Yes	3.1	46.5
Students' Academic Performance		
SAT score		
< 1000	2.0	1.8
1000–1099	3.7	5.1
1100–1199	8.6	10.6
1200–1299	17.2	16.1
1300–1399	26.3	20.0
1400–1499	26.5	26.9
1500–1600	13.3	40.8
Unknown	2.5	10.0
Sample mean = 1344		
National mean = 1016[a]		
Number of AP tests taken		
0	11.3	15.0
1	9.8	17.8
2	10.3	18.7
3	11.1	20.9
4	10.8	23.0
5	9.5	25.8
6	7.4	27.3
7	5.0	29.3
8	3.4	32.5
9+	3.5	36.2
Unknown	18.0	19.4
Sample mean = 4.2[b]		
National mean = 2.5[c]		

Note: Percentages may add up to 100.0 ± 0.1 because of rounding.

[a] College Board (2003).

[b] Both the sample and national mean for the number of AP tests taken are based on students who took at least one test.

[c] The data are for 1999 (Curry, MacDonald, and Morgan 1999).

Source: National Study of College Experience.

Table 2. High School Academic Environment and Percentage of Applicants Admitted: Fall 1997

Category	Percentage of Applicants	Percentage Admitted
Total Sample (*N* = 45,549)	100.0	21.9
High School Academic Environment		
Type of high school		
Public	58.9	21.2
Private	16.2	26.4
Religious[a]	13.6	21.6
Unknown	11.4	19.8
Elite 72		
No	91.6	21.5
Yes	8.5	27.1
Number of AP tests taken per high school senior (*n*)		
0	13.6	19.9
$0 < n < 0.4$	17.9	20.7
$0.4 \leq n < 0.8$	17.0	21.4
$0.8 \leq n < 1.5$	16.9	21.1
1.5+	18.0	25.4
Unknown	16.5	22.5
Average high school SAT score		
< 1000	11.9	19.6
1000–1099	28.5	20.1
1100–1199	28.4	21.3
1200–1299	13.9	25.2
1300–1600	8.0	29.4
Unknown	9.4	21.4

Note: Percentages may total 100.0 ± 0.1 because of rounding.

[a] Includes Catholic parochial schools and other independent schools with a religious affiliation.

Source: National Study of College Experience.

These individuals were admitted at somewhat higher rates than were students at nonelite high schools.

Data in the lower half of the table indicate that 14 percent of all the applications to the three universities came from students at schools where no AP examinations were taken, and slightly more (18 percent) came from students whose high schools averaged more than 1.5 AP tests per high school senior. In addition, 12 percent of the applications came from students in high schools whose average SAT score was lower than 1000. Most applicants, however, were from "better" schools. When attention is restricted to cases in which the average high school SAT score is known, nearly one quarter of the applications came from schools with an average SAT score of 1200 or higher. The probability of being accepted by an elite university is positively associated with both measures of a high school's academic strength.[3]

RESULTS

The results from the empirical analysis are shown in Table 3. We used logistic regression because the response variable is whether a given application was accepted (= 1) or not (= 0). Regression coefficients are exponentiated to reflect odds ratios. Model 1 includes applicants' demographic and social characteristics. Model 2 adds individual students' academic performance. In Model 3, students' scholastic ability is removed, and two indicators of high school academic reputation are added. Model 4 includes all student and institutional variables.

We begin by considering the influence of candidates' demographic and social characteristics. The effects of sex, race, citizenship, athletic ability, and legacy status in Model 1 are similar to those in Model 3. Female, black, Hispanic, recruited athlete, and legacy applicants receive statistically significant admission preferences, whereas Asians and non-U.S. citizens are at a disadvantage relative to those in the reference groups. Preferences are the largest for athletes, followed by those for children of alumni. Many of these effects are stronger in Models 2 and 4, in which measures of students' academic performance are included. Compared to Models 1 and 3, the odds of admission for applicants who are black, Hispanic, or recruited athletes increase by a factor of 2 or more. The preference for athletes outweighs that for any other group. Smaller increases are registered by women and legacies, and the Asian disadvantage increases. Asian applicants are more than 30 percent less likely to be admitted than are white candidates with the same academic accomplishments. The most striking of these changes can be explained by the fact that blacks and Hispanics have, on average, weaker academic credentials than have white applicants, and recruited athletes are less well prepared than are nonathletes. Asian students typically score higher on the SAT test and take more AP tests than do their white counterparts.[4] We turn next to an examination of the five hypotheses.

Hypothesis 1

The results to test Hypothesis 1 are presented in Model 4 of Table 3. Here, we control for students' personal characteristics and for high school academic environment. A student's score on the SAT I examination is positively and significantly related to the probability of admission. So steep is the SAT gradient that the odds of being admitted for a student whose score is in the 1500–1600 range are more than 200 times as high as those for a student whose score is lower than 1000. The number of AP tests displays a similar pattern. Students with one AP test in their portfolio have 31 percent higher odds of being accepted than do students with no AP tests. The admission advantage is statistically significant and cumulative the more AP examinations a student has taken. As expected, both measures of individual students' academic performance have a positive effect on admission outcomes (see Figures 1 and 2).

Hypothesis 2

The second hypothesis expects that applicants from high schools with a reputation for academic excellence will have a better chance of admission to an elite college, apart from information about individual students. Private schools are generally perceived by admission deans as more venerable than are public or parochial schools (Cookson and Persell 1985), and the elite72 variable is designed to capture institutional prestige. We used these two measures to test for reputational effects, rather than school-average SAT scores or the number of AP tests per senior. These latter indicators are directly influenced by students' academic performance, which we already know is positively related to admission outcomes. Model 3, which does not control for individual students' academic credentials, provides support for this hypothesis. Students who attend private secondary schools are 26 percent significantly more likely to be admitted than are public school applicants. Candidates from schools with a religious affiliation are somewhat less likely to be accepted than are public school students. The odds of being admitted if one attends an elite secondary school—regardless of the type of school—are 34 percent significantly higher than are the chances of admission for students at nonelite high schools.

Table 3. Odds Ratios from Logistic Regression Estimates of the Effect of Students' and High Schools' Characteristics on the Probability of Admission

Predictor Variables	Model 1	Model 2	Model 3	Model 4
Students' Personal Characteristics				
Sex				
(Male)	—	—	—	—
Female	1.112***	1.435***	1.114***	1.452***
Race				
(White)	—	—	—	—
Black	1.784***	5.791***	1.799***	5.685***
Hispanic	1.540***	3.379***	1.573***	3.294***
Asian	0.892***	0.682***	0.894***	0.690***
Other	1.014	1.143*	0.989	1.114
Unknown	0.875	0.728***	0.854	0.771**
Citizenship				
(U.S.)	—	—	—	—
Non-U.S.	0.637***	0.799***	0.630***	0.791***
Athlete				
(No)	—	—	—	—
Yes	3.163***	6.102***	3.181***	6.486***
Legacy				
(No)	—	—	—	—
Yes	2.560***	2.894***	2.470***	2.995***
Students' Academic Performance				
SAT score				
< 1000		0.049***		0.041***
1000–1099		0.161***		0.147***
1100–1199		0.459***		0.442***
(1200–1299)		—		—
1300–1399		1.682***		1.701***
1400–1499		3.371***		3.433***
1500–1600		8.524***		8.742***
Unknown		0.398***		0.366***
Number of AP tests taken				
(0)		—		—
1		1.192**		1.312***
2		1.258***		1.409***
3		1.312***		1.519***
4		1.516***		1.795***
5		1.746***		2.145***
6		1.823***		2.261***
7		2.036***		2.571***
8		2.307***		2.964***
9+		2.751***		3.524***
Unknown		2.413***		2.240***

Continued

Table 3. Continued

Predictor Variables	Model 1	Model 2	Model 3	Model 4
High School Academic Environment				
Type of high school				
(Public)			—	—
Private			1.263***	1.395***
Religious			0.923*	1.105*
Unknown			1.267***	0.899
Elite 72				
(No)			—	—
Yes			1.344***	1.109*
Number of AP tests taken per high school senior (*n*)				
(0)				—
$0 < n < 0.4$				0.813*
$0.4 \leq n < 0.8$				0.636***
$0.8 \leq n < 1.5$				0.550***
1.5+				0.469***
Unknown				0.587***
Average high school SAT score				
(< 1000)				—
1000–1099				0.789***
1100–1199				0.774***
1200–1299				0.817**
1300–1600				0.968
Unknown				1.080
Number of Cases	45,549	45,549	45,549	45,549
Likelihood Ratio Chi-squared (*df*)	3245.97(65)	8817.54(82)	3386.86(69)	9105.25(96)
Pseudo R^2	0.0677	0.1840	0.0707	0.1900

Note: Reference categories are shown in parentheses. Geographic area (51 U.S. state dummy variables, including Puerto Rico and Washington, DC, and "other," "foreign," and "unknown" areas) and two institution dummy variables (total of 56 variables) are included in all the models presented here as control variables, but the estimated coefficients are not reported in the table.

* $p < .05$, ** $p < .01$, *** $p < .001$.

Source: National Study of College Experience.

Hypothesis 3

We expect that school-average achievement levels will have a negative effect on admission probabilities, net of an individual student's own academic qualifications and other personal attributes. Model 4 contains the data for this hypothesis. Note first that both school type and elite72 behave as expected. Students at private schools have a 40 percent higher admission advantage over their public school counterparts. Admission officers also give a slight edge (roughly 10 percent) to students at religiously affiliated schools. Attending one of the six dozen elite secondary schools is equivalent to having an 11 percent admission advantage.[5]

With regard to one of the two measures of high school academic context, there is a signi-

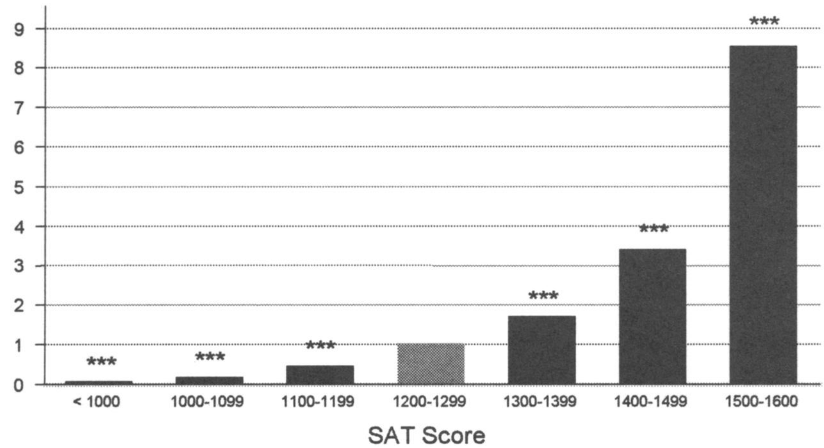

Figure 1. Estimated Odds Ratios for Admission, by Students' Academic Performance: SAT Score

Note: Based on the estimates for Model 4, Table 3. The lighter colored bar represents the reference category. * $p < .05$, ** $p < .01$, *** $p < .001$.

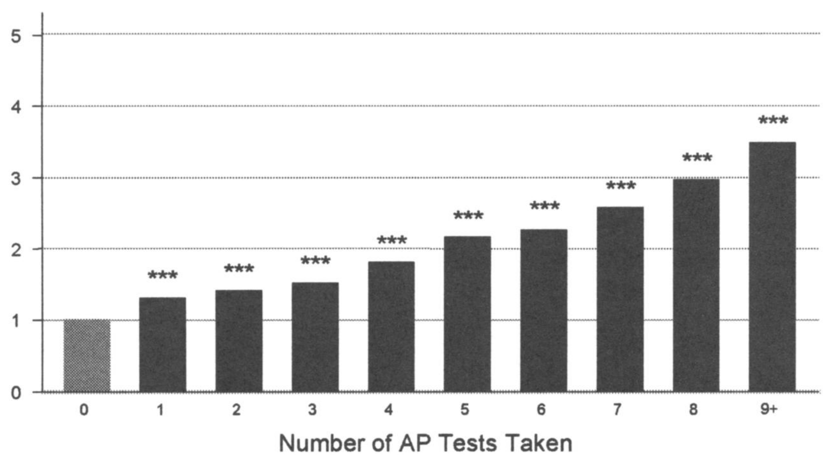

Figure 2. Estimated Odds Ratios for Admission, by Students' Academic Performance: Number of AP Tests Taken

Note: Based on the estimates for Model 4, Table 3. The lighter colored bar represents the reference category. * $p < .05$, ** $p < .01$, *** $p < .001$.

ficantly negative relation, as expected, between the number of AP tests per high school senior and admission outcomes. A student has the best odds of being accepted by an elite college if he or she comes from a high school where no AP tests are taken (and, presumably, where no AP courses are offered). These odds steadily deteriorate as a high school's academic climate improves. If a student with the same academic credentials applies from a high school where the average number of AP tests per senior is between 0.4 and 0.8, the odds of admission are 36 percent lower. And at the most competitive high schools—those with more than 1.5 AP tests per senior—the same applicant has 53 percent lower odds of admission. These contextual effects strongly support our central hypothesis.

Moreover, with regard to the other measure of high school academic context, an applicant from a high school whose average SAT score is in the 1000–1099 or 1100–1199 range has more than 20 percent significantly lower odds of being accepted than does a student who attends a school whose average SAT score is lower than 1000. In the latter case, the student has a much better chance of rising to the top of his or her class. Attending a high school with a schoolwide SAT score of between 1200 and 1300 is associated with 18 percent significantly lower odds of admission. Beyond a high school average SAT score of 1300, the odds of admission are not statistically different from what they would be for students from schools with an average score that is lower than 1000. However, more than nine tenths of applications in our sample originated from schools whose average SAT scores were below 1300. The frog-pond model receives clear support over the broad range of school SAT scores in which most of the students in our sample are concentrated (see Figures 3 and 4).[6]

Hypothesis 4

We expect that the negative effect of schoolwide achievement levels on the probability of admission will weaken as students' academic performance improves. We examined these interactions and found that the negative effect of school academic context is indeed less for better students. Model 4 was first reestimated using continuous forms of SAT score and number of AP tests at both the individual and school levels. Logistic regression coefficients on the two measures of students' academic performance are positive and significant (at the .001 level). Both school context effects are negative and significant (at the .001 level). When two interaction terms, one for individual and school SAT score and another for individual and school number of AP tests, are added to the model, the four main effects have the same signs as before and are significant at the .001 level. Both interaction terms have significantly positive coefficients (p-values are 0.021 for SAT score and 0.002 for number of AP tests), suggesting that the negative effect of school context fades as students' SAT scores and the number of AP tests increase. The negative influence of school-average SAT scores disappears completely when students' SAT scores reach 1730. Therefore there is still a small negative effect of school-average SAT even for top students with SAT scores of 1600. Likewise, the adverse influence of school-average AP tests is

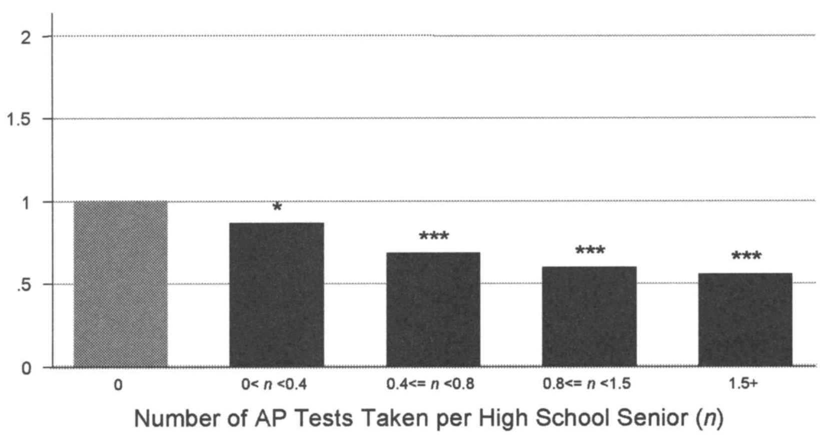

Figure 3. Estimated Odds Ratios for Admission, by High School Academic Environment: Number of AP Tests Taken per High School Senior
Note: Based on the estimates for Model 4, Table 3. The lighter colored bar represents the reference category. * $p < .05$, ** $p < .01$, *** $p < .001$.

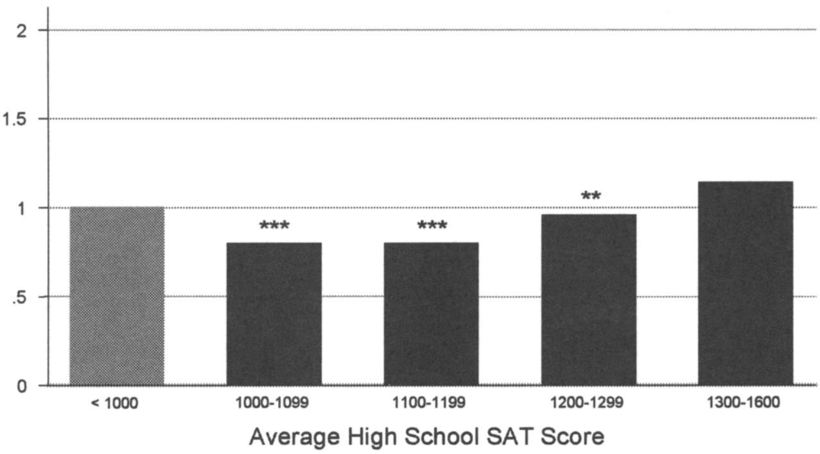

Figure 4. Estimated Odds Ratios for Admission, by High School Academic Environment: Average High School SAT Score
Note: Based on the estimates for Model 4, Table 3. The lighter colored bar represents the reference category. * $p < .05$, ** $p < .01$, *** $p < .001$.

exhausted for students who take 13.3 AP tests. The data in Table 1 suggest that few students reach such rarified levels. We conclude that there is a negative school AP effect for most students in our sample, but the effect is the weakest for students who take a large number of AP tests.

Hypothesis 5

To test whether information about high school academic context improves our understanding of elite college admissions, we need to compare the full Model 4 against Model 2. There is a modest gain in R^2 from 0.184 to 0.190. A chi-square test of the null hypothesis that the newly included variables in Model 4 add nothing to our understanding of admission outcomes has a test statistic value of 287.7 on 14 degrees of freedom, which is sufficient to reject the hypothesis at the .001 level. There is ample evidence in favor of Hypothesis 5. At the same time, it is clear that these school variables are not as important to the analysis, and presumably to admission deans, as are students' academic credentials. The increase in the explained variance when measures of students' academic performance are added is consistently much greater than when high school academic context is included.

TESTS FOR ROBUSTNESS

The evidence provides strong support for our principal hypothesis. Admission officers at elite colleges care how students perform academically relative to their peers at the same high school and reward applicants who rank high not only absolutely, but in comparison to their classmates. The purpose of this section is to probe deeper and to reexamine this conclusion from three different angles.

Clustered Observations

A potential methodological concern arises from the fact that our 45,549 applicants were grouped into roughly 8,800 secondary schools. Clustered observations within schools are not statistically independent, and while estimation procedures that ignore clustering yield unbiased coefficient estimates, they also produce standard errors that are too small. Our data appear to be influenced by a mild degree of clustering. Each of more than 40 percent of the high schools in the sample accounted for just a single application, and another 16 percent produced only two applications per school. At the other extreme, one secondary school sent 287 applications to these three elite universities. We reestimated

Model 4 in Table 3 (hereafter called the "baseline" model) using the Huber-White correction in Stata for correlated, clustered errors. This correction produces standard errors that are robust to clustering. The only difference that the Huber-White correction makes is that the coefficient on high school SAT scores in the 1200–1300 range is now significant at the 5-percent level instead of the 1-percent level. Another approach is to estimate a random-effects model with one random effect per high school. Doing so produces odds ratios that are qualitatively the same as are those in baseline Model 4 and significance levels that are identical. The negative effect of school-average AP tests is stronger using random effects. In short, two standard adjustments for clustered observations corroborate our original conclusions.

Applications from ACT States

More than 2 million high school students take the SAT test each year, and 1.7 million take the ACT test administered by the American College Testing Program (Zwick 2002). The SAT is the preferred test in the Northeast and the West, while the ACT predominates in the Midwest and the South. Students in ACT states who take the SAT typically have the strongest academic backgrounds and apply out of state to the nation's most selective colleges and universities (College Board 2003). Using school-average SAT scores as a measure of high school academic context may not therefore have the same meaning in ACT states as in non-ACT states. Specifically, not accounting for the proportion of students in a high school who take the SAT could affect our inferences concerning school-level effects.

Indirect Adjustment We tested the seriousness of this omission in two ways. We began by defining ACT states as states in which a larger fraction of high school seniors takes the ACT than the SAT test. This definition produced 26 ACT states (American College Testing Program 1997; Snyder and Hoffman 2000). We define secondary schools within ACT states as ACT high schools. If there is an applicant from an ACT high school and one from a non-ACT high school who are alike with respect to individual and high school average SAT scores and all other characteristics in the baseline model, a negative SAT school effect could lead to the student from the ACT high school having a higher probability of college admission. Admission officers may believe that the ACT high school is somewhat less competitive than the non-ACT high school if its school-average SAT score is based on the performance of a relatively small group of the best students.

To examine this possibility, we reestimated the baseline model by including a dummy variable (ACTSchool) for applications from secondary schools in ACT states. A total of 6,095 applications, or 13.4 percent of all applications, came from ACT high schools. The results in column 1 in Table 4 show that the estimated school effects are similar to those in the baseline model. As expected, the coefficient on ACTSchool is positive; students from high schools in ACT states have 31 percent higher odds of college admission, but the effect is not significant.

The negative SAT school effect in the baseline model of Table 3 is an average effect between high schools in ACT and non-ACT states. Does the influence of school-average SAT score depend on where a high school is located? To answer this question, we added an interaction term to the model in column 1, with the results shown in column 2 of Table 4. The SAT school effect in non-ACT states is shown by the main effects of high school SAT score. These effects are still negative, albeit somewhat weaker when compared to column 1, especially for average scores in the 1200–1300 range. The negative effect of high school SAT score is more pronounced in secondary schools in ACT states. Applicants from ACT schools whose school-average SAT scores are in the 1000–1100 range have one third lower odds of admission to elite universities than do students in ACT schools with average SAT scores that are lower than 1000. And compared to the same students, applicants from ACT high schools where the average SAT score is 1100 or higher have just half the chance of admission to an elite college. When school-average SAT scores are lower than 1000, applicants from ACT schools have 97 percent significantly higher odds of admission

Table 4. Adjusting High School Average SAT Scores for the Proportion of Students Taking the SAT Test (logistic regression coefficients shown as odds ratios)

	Indirect Adjustment		Direct Adjustment	
Predictor Variables	Additive (1)	Interactive (2)	Slope = -2.53 (3)	Slope = -3.79 (4)
Number of AP Tests Taken per High School Senior (n)				
(0)	—	—	—	—
$0 < n < 0.4$	0.815*	0.820*	0.915	0.920
$0.4 \leq n < 0.8$	0.638***	0.644***	0.743**	0.750**
$0.8 \leq n < 1.5$	0.552***	0.556***	0.648***	0.659***
1.5+	0.470***	0.471***	0.546***	0.565***
Unknown	0.592***	0.586***	0.665***	0.673***
Average High School SAT Score				
(< 1000)	—	—	—	—
1000–1099	0.787***	0.782***	0.768***	0.844**
1100–1199	0.770***	0.791***	0.668***	0.682***
1200–1299	0.814**	0.856*	0.680***	0.678***
1300–1600	0.966	1.004	0.802**	0.749***
Unknown	1.078	1.066	1.449**	1.494***
ACT Secondary School				
(No)	—	—		
Yes	1.311	1.971*		
Interaction Terms				
ACTSchool x HSSAT10-11		0.833		
ACTSchool x HSSAT11-12		0.615		
ACTSchool x HSSAT12-13		0.563*		
ACTSchool x HSSAT13-16		0.553		
ACTSchool x HSSAT unk		1.475		
Number of Cases	45,549	45,549	45,549	45,549
Likelihood Ratio Chi-squared (*df*)	9107.82(97)	9133.69(102)	9163.24(96)	9158.29(96)
Pseudo R^2	0.1901	0.1906	0.1912	0.1911

Note: All four models in Table 4 include as additional predictor variables all the variables in Model 4 of Table 3. Coefficients on other predictor variables not shown in Table 4 are similar to those in the baseline model in Table 3.

* $p < .05$, ** $p < .01$, *** $p < .001$.

Source: National Study of College Experience.

than have students from non-ACT schools. The ACT school admission advantage diminishes as school-average SAT scores rise. These indirect adjustments to account for high schools in ACT states leave intact our principal conclusion that there is a significantly negative high school SAT effect. This effect appears to be somewhat stronger in ACT states. The negative AP school effect is essentially unchanged between columns 1 and 2.

Direct Adjustment The College Board (2003:1) observed that, "The most significant factor to consider in interpreting SAT I scores for any group, or subgroup, of test-takers is the proportion of students taking the test." Our second reassessment relies on a direct adjustment of each high school's average SAT score for the proportion of seniors taking the SAT.

Consider the following "parallel lines" model,

$$mSAT_{s,t} = \alpha_t + \beta_s + \gamma Pct_{s,t} + \varepsilon_{s,t}, \quad (1)$$

where S individual states are the units of observation, $mSAT_{s,t}$ is the mean SAT score in state s in year t, α_t is an intercept term in year t, β_s represents S-1 state-level dummy variables or "fixed" effects, γ is the change in the average state SAT score corresponding to a one-unit increase in the percentage of high school graduates who take the SAT, $Pct_{s,t}$ is the percentage of graduates taking the SAT in state s in year t, and $\varepsilon_{s,t}$ is a random error term.[7] We expect that $\gamma < 0$. Now assume that the same model also holds k years earlier, except that the entire system of parallel lines could have shifted up or down during the period. Then we have

$$mSAT_{s,t-k} = \alpha_{t-k} + \beta_s + \gamma Pct_{s,t-k} + \varepsilon_{s,t-k}. \quad (2)$$

Subtracting Equation 2 from Equation 1 yields

$$(mSAT_{s,t} - mSAT_{s,t-k}) = (\alpha_t - \alpha_{t-k}) + \gamma\,(Pct_{s,t} - Pct_{s,t-k}) + (\varepsilon_{s,t} - \varepsilon_{s,t-k}). \quad (3)$$

Equation 3 was estimated over two alternative time intervals using data on all 50 states from various issues of the National Center for Education Statistics' annual *Digest of Education Statistics*. For the period beginning 1987–88 and ending 2001–02, the estimated intercept term is 28.4, slope (γ) is -2.53, and R^2 is 0.32. Both estimated parameters are significant at the .001 level. These results imply that each percentage-point increase in the proportion of a state's high school graduates who take the SAT is associated with an expected decline of 2.53 points in the state's average SAT score. When Equation 3 is estimated for the period from 1987–88 to 1996–97, the estimated intercept is 19.7, the slope is -3.79, and R^2 is 0.47. Both the estimated intercept and the slope coefficient are significant at the .001 level.

We assume that the slope coefficients derived from aggregate state data translate to the secondary school level and can be used to make two independent estimates of what each secondary school's average SAT score would have been if 42 percent of the students took the SAT—the national average in 1996–97 (Snyder and Hoffman 2000:151). These estimates require data on the percentage of high school graduates who took the SAT at each high school in 1996–97. Numerator data on the number of SAT takers came from the College Board. Denominator data were derived from the SDQ variable on the size of a high school's senior class. Suppose that a high school's unadjusted average SAT score is 1000 and 76 percent of seniors take the examination. Then, with a slope coefficient of -2.53, the adjusted school-average SAT score is 1086 (= 1000 - 2.53(42-76)). The baseline model was then reestimated using two alternative sets of adjusted values for school-average SAT score. The results are shown in columns 3 and 4 of Table 4.

The negative effect of school-average SAT score is now much stronger, more persistent across SAT ranges, and more statistically significant than in the baseline case. Attending a high school whose average SAT score is between 1200 and 1300 versus one with an average score below 1000 lowers the odds of admission by 32 percent in columns 3 and 4, compared with 18 percent in the baseline case. High schools with average SAT scores above 1300 are associated with an insignificant 3 percent lower odds of admission in the baseline model, but with 20 percent significantly lower odds using a 2.53 slope adjustment and with 25 percent significantly lower odds with a 3.79 adjustment. The effects of school AP in columns 3 and 4 are negative and significant, although not quite as steep as in the baseline model. To summarize, the results using high school SAT scores that are adjusted for the proportion of graduates who took the SAT test lend added support to our central conclusion that in making decisions, admission officers at elite universities consider how students perform relative to their peers in the same high school.[8]

High School Class Rank

We have inferred a student's academic standing among peers at the same high school by comparing the student's SAT score and number of AP tests with the school-average SAT score and number of AP tests. A more customary way of evaluating applicants with respect to classmates is to rely on high school GPA and class rank. In this section, we incorporate these measures into the analysis. We use SDQ data that students supplied when they registered for the SAT. Students were instructed, "Please indicate your cumulative grade point average for all academic subjects in high school." They were also asked, "What is your most recent high school class rank?" We have SDQ responses for 75.6 percent of the applicants. In the remaining cases, the students chose not to complete the voluntary SDQ questionnaire, or it was not possible to match their answers to institutional records. The GPA distribution for students with SDQ data is A+ (29.2 percent), A (35.7 percent), and A- (20.9 percent). Just 14.2 percent responded with a lower GPA or refused to answer the question. Among the same group of applicants, 62.3 percent reported being in the top 10 percent of their high school class, another 18.7 percent were in the top 11–20 percent, 8.4 percent gave a lower ranking, and a tenth refused to answer.

Table 5 incorporates these new variables. High school GPA is positively and significantly related to elite college admission. In column 1, students with an A+ average have odds of admission that are more than four times as high as students with a B+ average or less. In column 2, controlling for GPA and other indicators of academic merit, an applicant's class rank is positively and significantly related to the probability of admission. Students in the top 10th of their high school class have more than twice the chance of being admitted to an elite university than have otherwise comparable students who rank in the bottom 80 percent. Applicants in the second decile have 40 percent higher odds of admission than have lower ranked candidates. Class rank matters, and it matters in the direction that Attewell's (2001) simulations predict.

The effects of GPA are somewhat stronger in Model 3 than in Model 2, and the effects of class rank are about the same. Compared with the baseline model in Table 3, attending a private or religious school gives a larger boost to admission chances. School-average AP effects are significantly negative, but the relation to admission outcomes is somewhat less steep. Admission outcomes are also significantly negatively related to school-aggregate SAT scores when average scores are below 1200, but the overall relation is marginally shallower than in the baseline.[9] Tests that substitute data on class rank and GPA from high school transcripts for their counterparts from the SDQ in Model 3 of Table 5 produce the same pattern of results for GPA, class rank, and the four high school context variables. The fact that the negative school-level SAT and AP effects are preserved when class rank and GPA are included suggests that these high school contextual measures constitute resilient and independent barometers of students' relative class standing when they are juxtaposed with individual students' performance on the SAT and AP tests. At the same time, these results explicitly show the importance of high school class rank over and above other indicators of comparative academic performance.

The effect of class rank could depend on high school academic context. In particular, it may matter most for applicants from less academically competitive high schools, where there are relatively few excellent students and academic distinctions among them are clear. We hypothesize that admission officers place less weight on class rank if applicants come from schools where there is a high concentration of talented students and where differences among the top students are small and difficult to discern. To examine this hypothesis, we interacted SDQ class rank with high school type, elite72, school-average number of AP tests, and school-average SAT score and added each group of interaction terms one at a time to Model 3 in Table 5. Each set of interactions typically is statistically significant at the .001 level, and the class-rank gradient is the steepest for applicants from weaker schools. Admission officers normally give more weight to class rank in public high

Table 5. Effect of High School GPA and Class Rank on Admission Outcomes: Evidence from the Student Descriptive Questionnaire (Coefficients shown as odds ratios)

	Adding High School GPA and Class Rank		
Predictor Variables	(1)	(2)	(3)
High School GPA			
A +	4.229***	2.859***	3.308***
A	2.837***	2.054***	2.333***
A -	1.687***	1.424***	1.506***
(B + or less)	—	—	—
No response	1.995***	1.573***	1.641***
High School Class Rank			
Top 10 percent		2.196***	2.221***
Next 10 percent		1.399***	1.416***
(Bottom 80 percent)		—	—
No response		1.811***	1.699***
Type of High School			
(Public)			—
Private			1.625***
Religious			1.152**
Unknown			1.118
Elite 72			
(No)			—
Yes			1.144*
Number of AP Tests Taken per High School Senior (n)			
(0)			—
$0 < n < 0.4$			0.860
$0.4 \leq n < 0.8$			0.742**
$0.8 \leq n < 1.5$			0.672***
1.5+			0.630***
Unknown			0.723***
Average High School SAT Score			
(< 1000)			—
1000–1099			0.788***
1100–1199			0.815***
1200–1299			0.920
1300–1600			1.099
Unknown			1.018
Number of Cases	45,549	45,549	45,549
Likelihood Ratio Chi-squared (*df*)	10239.93(94)	10386.54(97)	10690.24(111)
Pseudo R^2	0.2137	0.2168	0.2231

Note: Reference categories are shown in parentheses. All three models also include dummy variables for 54 geographic areas and two institutions, all other student-level variables in the baseline model, plus the number of SAT II Achievement (or Subject) tests that a student has taken and the student's average score on these tests. SAT II data were provided by ETS.

* $p < .05$, ** $p < .01$, *** $p < .001$.

Source: National Study of College Experience.

schools, in schools where no seniors have taken any AP test, and where school-average SAT scores are lower than 1000. For example, when SDQ class rank is interacted with high school SAT score, the ratio of the odds of being admitted from the top 10 percent of one's class to the odds of admission for applicants in the 80th–90th percentile is 2.2 when school-average SAT scores are less than 1000, 1.6 when school-average scores are in the 1000–1100 range, and about 1.3 when school-average scores are higher than 1100.

DISCUSSION

Most previous research on access to postsecondary education has been incomplete because it has focused on schools that students actually attend and has overlooked the intervening processes of application and admission to college. It is not that gatekeeping functions of colleges and universities are believed to be unimportant or uninteresting but, rather, that data on who applies and who is accepted are difficult to obtain (Bowen and Levin 2003; Karen 1991). In this article, we entered the "little understood black box" (Hearn 1991:168) in which high school graduates are matched to particular college destinations and investigated the role of college admission officers in the overall sorting process. Studies of factors that affect admission outcomes have identified the attributes of individual students, including test scores, sex, race, athletic ability, and legacy status. The characteristics of secondary schools have rarely been considered. An important aim of this article was to assess the simultaneous roles of the characteristics of individual applicants and the academic context of high schools. We examined the selection mechanisms of elite universities at the highest echelon of American higher education. Elite education has been neglected, partly because its students constitute a small fraction of all undergraduates (Carnevale and Rose 2004). Moreover, it is in these schools where one expects the salience of selection criteria to emerge (Kane 1998). What is most important, prestigious educational institutions at all levels play critical roles in the transmission of power and privilege to those in high-status educational and career tracks (Cookson and Persell 1985; Kingston and Lewis 1990a).

The origins of our analysis are in relative deprivation and social comparison theories. Variously known as the frog-pond model (Davis 1966) or the big-fish–little-pond effect (Marsh 1987), the theory highlights a social comparison dynamic that is presumed to animate individual behavior. In particular, when individual students' ability is controlled, an increase in schoolwide achievement levels is expected to depress academic self-concepts and lower occupational and educational aspirations. This framework has been used to evaluate the effect of affirmative action on the supply of minority faculty at leading colleges and universities (Cole and Barber 2003) and the number of African Americans in the legal profession (Sander 2004).

Attewell (2001) adapted these concepts to college admissions. He hypothesized that institutional gatekeepers are susceptible to context effects and that a given student would have a better chance of being accepted by an elite college or university if he or she attended a high school with a smaller concentration of high-achieving peers. Admission deans care about high school class rank for several reasons. Colleges compete for students with proved scholastic ability, and being ranked at or near the top of one's class is a way of demonstrating this ability. Admission officers also know that their institutions' reputations depend on enrolling a large proportion of high-ranking entering students because the published annual standings of U.S. colleges and universities factor class rank into the formula (Hossler et al. 1999). There may also be a "diversity rationale" for emphasizing class rank in admission decisions. Its use prevents talented students at a relatively small number of exceptional secondary schools from dominating a college's first-year class (Attewell 2001).

Using data on more than 45,000 applications to three highly selective universities, we found broad support for Attewell's (2001) hypothesis. Whether a student's relative class standing is inferred by comparing individual students' achievement to school-average achievement levels or measured directly, there is a significant negative effect of average-student achievement levels on the likelihood of admission to an elite college. This conclusion is robust to tests for clustered observations and to adjustments to schoolwide SAT scores for the proportion of students who took the SAT. However, class rank does not apply with equal strength everywhere. The negative effects of higher school-average achievements are the weakest for the most outstanding students. In addition, class rank is a less important criterion for students who apply from schools with a high concentration of academically able students because, in these cases, fine distinctions among students in the upper tail of the distribution are difficult to make and interpret.

Although Attewell (2001) did not consider them, not all the effects that are associated with a stronger high school academic environment are necessarily negative. For example, Marsh et al. (2000) showed that perceived school status has counterbalancing positive or "reflected-glory" effects on academic self-concept. In addition, despite their negative effects on grades and class rank, institutional selectivity and prestige have positive outcomes for rates of passing the bar (Sander 2004), college graduation and later income (Kane 1998; Kingston and Smart 1990), and the likelihood of earning a professional or doctoral degree (Bowen and Bok 1998). We, too, found counterbalancing effects on college admission. Students who attend private or religious secondary schools and those whose high schools are viewed by veteran admission officers as elite are significantly more likely to be admitted to an elite university. In addition, it is plausible that students learn more in a more intellectually challenging environment. The existence of these positive effects means that admission deans must weigh trade-offs between a school's academic reputation and an individual student's relative academic performance. A possible solution, as we noted earlier, is to downgrade the importance of a candidate's class rank at the most competitive high schools.

Our results also provide another test of the "school context hypothesis." The received wisdom suggests that high school effects are generally modest (Alexander and Eckland 1975). But high school contextual variables, especially those that are related to the academic quality of schools and their student bodies, have not been examined in studies of admission to college. Our four contextual indicators are individually and jointly statistically significant, but they do not add as much to the explained variance as do the attributes of individual students. These findings support the school context hypothesis but also reinforce the secondary importance of context in relation to individual student effects.

To what extent does admission to an elite college reflect meritocratic ideals? Our findings show that academic merit matters first and foremost at highly selective institutions. Significantly positive and monotonic relations between the chances of admission and such academic credentials as high school GPA, standardized test scores, and the number of AP and SAT II tests that are taken, together with the fact that the greatest increment in the explained variance occurs when measures of students' academic performance are included, provide convincing evidence that meritocratic standards are being applied. These findings are consistent with prior research on access to colleges at particular levels of selectivity (Hearn 1984, 1991; Karabel and Astin 1975; Karen 2002). At the same time, nonacademic criteria are also in play. Admission doors are open wider for members of traditionally excluded groups, including women and especially African American and Hispanic applicants. And substantial preferences are extended to recruited athletes and children of alumni. Some scholars have referred to the use of ascriptive characteristics as reflecting nonmeritocratic tendencies (Hearn 1991). Alternatively, it may be necessary to broaden our conception of merit to include all characteristics of students that contribute to the mission of an institution (Bowen and Bok 1998).

Despite some evidence that elite education creates the possibility of upward mobility for a few high-achieving students from modest socioeconomic backgrounds (Levine and Nidiffer 1996; Persell and Cookson 1985), research has typically shown that higher education is characterized by persistent inequality (Hearn 1984, 1991; Karabel and Astin

1975; Karen 2002). Students from higher socioeconomic (SES) backgrounds are more likely to attend more selective colleges and universities (Kingston and Lewis 1990b). Our findings generally support this conclusion. We have shown that SAT scores and the number of AP tests taken are positively related to admission outcomes, but academic credentials are also positively correlated with SES (Karabel and Astin 1975). The admission advantage conferred on alumni children is another indication that privilege is tied across generations. Parents who can afford to send their sons and daughters to private secondary schools or who live in affluent neighborhoods whose schools have proved academic reputations give their children a leg up in the competition for spots at prestigious universities. We should remark in passing that evidence that being in an elite track in secondary school enhances admission to an elite college begins to establish the "social arithmetic" for how high-status tracks are linked across school settings (Kingston and Lewis 1990a:xxv). Finally, in an expanded version of this article, we showed that although some elite universities practice economic affirmative action for students in the lowest SES categories—first-generation college students and those from families whose annual incomes are lower than $30,000—this small advantage on an all-other-things-equal basis is not sufficient to overcome the fact that higher-SES students have been consistently favored over ones from lower-SES backgrounds in simple tabulations of admission rates by social class (Espenshade, Hale, and Chung 2004).

We have shown that high school academic context and a student's relative class standing matter to admission deans at elite colleges and universities. To flesh out the remaining features of the black box that connects high school students to particular college destinations, researchers should investigate the relative importance of individual students' attributes versus high school characteristics at other levels of college selectivity. Further work is needed, too, on students and their decisions about where to apply and where to enroll once they are accepted, as well as on whether the characteristics of students' undergraduate institutions affect admission to graduate and professional schools.

Contextual effects may be relevant to institutional gatekeepers outside education. One particularly fruitful area to explore is the job market. In his review of this article, Herbert Marsh suggested that all but the top students in Davis's (1966) original study perhaps had good reason to aim for lower academic-performance careers to the extent that evaluators of job applications use selection criteria that are similar to those of evaluators of applications to colleges and universities. In addition, after examining the job market for new lawyers, Sander (2004) concluded that employers of lawyers in both private law firms and governmental agencies place more weight on grades than on the eliteness of schools unless the lawyers graduated from Yale or Harvard. On the other hand, Kingston and Smart (1990:169) emphasized the generally greater effects of prestige on early career earnings from attending a more elite institution: "To state these findings in terms of financial advice, we are inclined to say: go to an elite college (and don't worry about your grades unless you want to go to a professional school), but if you can't get into one of these schools, don't worry too much about where else to go because the name of your alma mater won't be important." These disparate conclusions suggest the following hypothesis: The relative importance of frog-pond effects to institutional gatekeepers may depend on the particular organizational setting, on who is doing the evaluating, and on how essential high intellectual ability is to the mix of skills that are being sought.

NOTES

1. In exchange for these schools' participation, we promised to protect the identity of each institution and to safeguard the confidentiality of all information on students.

2. More accurately, 45,549 represents the number of applications, not the number of applicants. A small number of students applied to more than one of these institutions.

3. When the variables are expressed in continuous form, the correlation between individual students' SAT scores and the number of AP examinations is 0.46. The correlation between their school-average counterparts is 0.62. Neither is large enough to suggest problems with collinearity.

4. Among applicants to these three universities, the average SAT I score and average number of AP tests, respectively, were 1208 and 2.1 for blacks, 1245 and 3.1 for Hispanics, 1359 and 3.5 for whites, and 1371 and 4.3 for Asians. The numbers for athletes were 1294 and 2.5 versus 1346 and 3.7 for nonathletes.

5. Baltzell (1958) identified 16 of the most socially prestigious American boarding schools—what Cookson and Persell (1985) called the "select 16." Nearly 3 percent of the applicants in our sample attended one of the select 16 schools, and 26.6 percent of them were accepted by an elite university, compared with 21.8 percent of all other candidates. We created a dummy variable for the select 16 schools and substituted it for elite72 in Model 4. Its regression coefficient implies that students from one of these schools are 4.3 percent *less* likely to be accepted than are applicants from nonselect 16 schools, but the effect is not statistically significant (*p*-value of 0.609). Nor does the select 16 variable perform as well when it is substituted for elite72 in Model 3. Students who attend select 16 schools are 9 percent more likely than are other applicants to be admitted, but the effect is not significant (*p*-value of 0.251).

6. Model 4 was fit separately to data from each institution. All three universities exhibit qualitatively similar behaviors, as one would expect, given the common aims and values of the institutions and the wide variety of students from which to choose. Underrepresented minority students, women, athletes, legacies, and applicants with high academic achievement have an admission advantage. In addition, preference is normally extended to students from private and elite high schools and to candidates whose high school academic environment is such that it permits them to distinguish themselves academically from their classmates. The most important way in which the three universities differ is in the proportion of applicants they accept, and we controlled for it with institutional dummy variables in the main model. In addition, we estimated some variants of Model 4 to test whether the inclusion of information on SAT (or AP) adds anything to the explained variance beyond AP (or SAT) variables. The 12 SAT variables (7 at the student level and 5 at the school level) are jointly significant when they are added to a version of Model 4 that excludes them, whether or not AP variables are included. The 15 AP variables (10 at the student level and 5 at the school level) are jointly significant when they are added to a version of Model 4 that excludes them, whether or not SAT variables are included. All the results are statistically significant at the .0001 level. Therefore, the SAT variables measure something different about individual-student and school-average achievement from their AP counterparts. Put differently, the set of SAT variables adds explanatory power on top of the AP variables, and vice versa. As a consequence, it is preferable to include both constructs in models of the effect of high school academic context.

7. We are grateful to Germán Rodríguez for suggesting this model.

8. It is not clear why students who attend high schools whose average SAT scores are unknown have such a large admission advantage over other students. One possibility is that the unadjusted school-average SAT scores were inflated (as suggested by the example in the previous paragraph) by an average of 52 points using the 2.53 slope criterion and by 79 points using 3.79. After adjustment, schools whose average scores are unknown and therefore cannot be adjusted appear to be relatively less competitive than before. A negative school SAT effect makes students at these schools now seem more attractive to admission officers. The fact that the boost to odds of admission when school SAT scores are unknown is higher when adjustments to school-average SAT scores are larger (see column 4) is consistent with this interpretation.

9. In results that are not reported in Table 5, estimated odds ratios for individual-level variables are similar across all three models. But there are important differences with prior

results from the baseline model. Stronger admission preferences are estimated for applicants who are black, Hispanic, athletes, or legacies. Less emphasis is placed on individual SAT scores and the number of AP tests, as indicated by the flatter slopes to the pattern of odds ratios. This outcome is at least partially explained by the inclusion of additional measures of academic merit, principally GPA and SAT II (Achievement) tests, with which SAT score and AP tests are positively correlated. Taking more than three SAT II tests and scoring well on them are positively and significantly related to admission outcomes.

REFERENCES

Alexander, Karl L., and Bruce K. Eckland. 1975. "Contextual Effects in the High School Attainment Process." *American Sociological Review* 40:402–16.

—. 1977. "High School Context and College Selectivity: Institutional Constraints in Educational Stratification." *Social Forces* 56:166–88.

American College Testing Program. 1997. "ACT Average Composite Scores by State, 1997 ACT-Tested Graduates." Available on-line at http://www.act.org/news/data/97/97states.html

Attewell, Paul. 2001. "The Winner-Take-All High School: Organizational Adaptations to Educational Stratification." *Sociology of Education* 74:267–95.

Baltzell, E. Digby. 1958. *Philadelphia Gentlemen—The Making of a National Upper Class.* Chicago: Quadrangle Books.

Bowen, William G., and Derek Bok. 1998. *The Shape of the River: Long-Term Consequences of Considering Race in College and University Admissions.* Princeton, NJ: Princeton University Press.

Bowen, William G., and Sarah A. Levin. 2003. *Reclaiming the Game: College Sports and Educational Values.* Princeton, NJ: Princeton University Press.

Carnevale, Anthony P., and Stephen J. Rose. 2004. "Socioeconomic Status, Race/Ethnicity, and Selective College Admissions." Pp. 101–56 in *America's Untapped Resource: Low-Income Students in Higher Education,* edited by Richard D. Kahlenberg. New York: Century Foundation Press.

Cole, Stephen, and Elinor Barber. 2003. *Increasing Faculty Diversity: The Occupational Choices of High-Achieving Minority Students.* Cambridge, MA: Harvard University Press.

College Board. 2003, August 26. *SAT Verbal and Math Scores Up Significantly as a Record-breaking Number of Students Take the Test* (Report N0218). New York: Author.

Cookson, Peter W., Jr., and Caroline Hodges Persell. 1985. *Preparing for Power: America's Elite Boarding Schools.* New York: Basic Books.

Curry, Wade, Walt MacDonald, and Rick Morgan. 1999. "The Advanced Placement Program: Access to Excellence," *Journal of Secondary Gifted Education* 11:17–22.

Davis, James A. 1966. "The Campus as a Frog Pond: An Application of the Theory of Relative Deprivation to Career Decisions of College Men." *American Journal of Sociology* 72:17–31.

Duffy, Elizabeth A., and Idana Goldberg. 1998. *Crafting a Class: College Admissions and Financial Aid, 1955–1994.* Princeton, NJ: Princeton University Press.

Espenshade, Thomas J., Chang Y. Chung, and Joan L. Walling. 2004. "Admission Preferences for Minority Students, Athletes, and Legacies at Elite Universities." *Social Science Quarterly* 85:1422–46.

Espenshade, Thomas J., Lauren E. Hale, and Chang Y. Chung. 2004, September. "High School Academic Environment, Class Rank, and Elite College Admission." Unpublished manuscript, Office of Population Research, Princeton University.

Hauser, Robert M., William H. Sewell, and Duane F. Alwin. 1976. "High School Effects on Achievement." Pp. 309–41 in *Schooling and Achievement in American Society,* edited by William H. Sewell, Robert M. Hauser, and David L. Featherman. New York: Academic Press.

Hearn, James C. 1984. "The Relative Roles of Academic, Ascribed, and Socioeconomic Characteristics in College Destinations." *Sociology of Education* 57:22–30.

—. 1991. "Academic and Nonacademic Influences on the College Destinations of 1980 High School Graduates." *Sociology of Education* 64:158–71.

Hossler, Don, Jack Schmit, and Nick Vesper. 1999. *Going to College: How Social, Economic, and Educational Factors Influence the Decisions Students Make.* Baltimore: Johns Hopkins University Press.

Kane, Thomas J. 1998. "Racial and Ethnic Preferences in College Admissions." Pp. 431–56 in *The Black-White Test Score Gap,* edited by Christopher Jencks and Meredith Phillips. Washington, DC: Brookings Institution Press.

Karabel, Jerome, and Alexander W. Astin. 1975.

"Social Class, Academic Ability, and College 'Quality.'" *Social Forces* 53:381–98.

Karen, David. 1990. "Toward a Political-Organizational Model of Gatekeeping: The Case of Elite Colleges." *Sociology of Education* 63:227–40.

—. 1991. "'Achievement' and 'Ascription' in Admission to an Elite College: A Political-Organizational Analysis." *Sociological Forum* 6:349–80.

—. 2002. "Changes in Access to Higher Education in the United States: 1980–1992." *Sociology of Education* 75:191–210.

Kingston, Paul William, and Lionel S. Lewis. 1990a. "Introduction: Studying Elite Schools in America." Pp. xi–xxxiv in *The High-Status Track: Studies of Elite Schools and Stratification,* edited by Paul William Kingston and Lionel S. Lewis. Albany: State University of New York Press.

—. 1990b. "Undergraduates at Elite Institutions: The Best, the Brightest, and the Richest." Pp. 105–20 in *The High-Status Track: Studies of Elite Schools and Stratification,* edited by Paul William Kingston and Lionel S. Lewis. Albany: State University of New York Press.

Kingston, Paul William, and John C. Smart. 1990. "The Economic Pay-Off of Prestigious Colleges." Pp. 147–74 in *The High-Status Track: Studies of Elite Schools and Stratification,* edited by Paul William Kingston and Lionel S. Lewis. Albany: State University of New York Press.

Levine, Arthur, and Jana Nidiffer. 1996. *Beating the Odds: How the Poor Get to College.* San Francisco: Jossey-Bass.

Lillard, Dean, and Jennifer Gerner. 1999. "Getting to the Ivy League: How Family Composition Affects College Choice." *Journal of Higher Education* 70:706–30.

Manski, Charles F., and David A. Wise. 1983. *College Choice in America.* Cambridge, MA: Harvard University Press.

Marsh, Herbert W. 1987. "The Big-Fish-Little-Pond Effect on Academic Self-Concept." *Journal of Educational Psychology* 79:280–95.

—. 1991. "Failure of High-Ability High Schools to Deliver Academic Benefits Commensurate with Their Students' Ability Levels." *American Educational Research Journal* 28:445–80.

Marsh, Herbert W., Danuta Chessor, Rhonda Craven, and Lawrence Roche. 1995. "The Effects of Gifted and Talented Programs on Academic Self-Concept: The Big Fish Strikes Again." *American Educational Research Journal* 32:285–319.

Marsh, Herbert W., and Kit-Tai Hau. 2003. "Big-Fish-Little-Pond Effect on Academic Self-Concept: A Cross-Cultural (26-Country) Test of the Negative Effects of Academically Selective Schools." *American Psychologist* 58:364–76.

Marsh, Herbert W., Olaf Köller, and Jürgen Baumert. 2001. "Reunification of East and West German School Systems: Longitudinal Multilevel Modeling Study of the Big-Fish-Little-Pond Effect on Academic Self-Concept." *American Educational Research Journal* 38:321–50.

Marsh, Herbert W., Chit-Kwong Kong, and Kit-Tai Hau. 2000. "Longitudinal Multilevel Models of the Big-Fish-Little-Pond Effect on Academic Self-Concept: Counterbalancing Contrast and Reflected Glory Effects in Hong Kong Schools." *Journal of Personality and Social Psychology* 78:337–49.

Marsh, Herbert W., and John W. Parker. 1984. "Determinants of Student Self-Concept: Is It Better to Be a Relatively Large Fish in a Small Pond Even If You Don't Learn to Swim as Well?" *Journal of Personality and Social Psychology* 47:213–31.

Mathews, Jay. 1998. *Class Struggle: What's Wrong (and Right) with America's Best Public High Schools.* New York: Times Books.

McDonough, Patricia M. 1997. *Choosing Colleges: How Social Class and Schools Structure Opportunity.* Albany: State University of New York Press.

Persell, Caroline Hodges, and Peter W. Cookson, Jr. 1985. "Chartering and Bartering: Elite Education and Social Reproduction." *Social Problems* 33:114–29.

Sander, Richard H. 2004. "A Systemic Analysis of Affirmative Action in American Law Schools." *Stanford Law Review* 57:367–483.

Santoli, Susan P. 2002. "Is There an Advance Placement Advantage?" *American Secondary Education* 30:23–35.

Shulman, James L., and William G. Bowen. 2001. *The Game of Life: College Sports and Educational Values.* Princeton, NJ: Princeton University Press.

Snyder, Thomas D., and Charlene M. Hoffman. 2000. *Digest of Education Statistics, 1999.* Washington, DC: National Center for Education Statistics, U.S. Department of Education.

Toor, Rachel. 2001. *Admissions Confidential: An Insider's Account of the Elite College Selection Process.* New York: St. Martin's Press.

Yaqub, Reshma Memon. 2002, September. "Getting Inside the Ivy Gates." *Worth,* pp. 94–104.

Zwick, Rebecca. 2002. *Fair Game? The Use of Standardized Admissions Tests in Higher Education.* New York: RoutledgeFalmer.

Thomas J. Espenshade *is Professor of Sociology and Faculty Associate at the Office of Population Research, Princeton University. His research interests include higher education in the United States, the racial dimensions of college admission and campus life, intergroup relations on college campuses, and social demography. He is directing the National Study of College Experience and is a Co-Principal Investigator on the Campus Life in America Student Survey.*

Lauren E. Hale *received her Ph.D. in public affairs from Princeton University in 2003. She is currently Assistant Professor of Preventive Medicine at the State University of New York, Stony Brook. Her research includes higher education, health disparities, and related topics in social demography.*

Chang Y. Chung *is a Senior Statistical Programmer at the Office of Population Research, Princeton University. He has a Ph.D. in sociology from the University of South Carolina and a master's degree in systems engineering from the University of Pennsylvania. He is currently involved in major research projects on migration in Thailand and higher education in the United States.*

Support for this research was provided by the Andrew W. Mellon Foundation and Center Grant P30 HD32030 from the National Institute of Child Health and Human Development. The authors thank Don Betterton, Emily Espenshade, Jean Grossman, Fred Hargadon, Michael Hout, Stephen LeMenager, Keith Light, Janet Rapelye, Jake Rosenfeld, Chris Simmons, Christopher Weiss, and Charles Westoff for their useful comments and suggestions; Scott Lynch, Germán Rodríguez, and Bruce Western for their methodological advice; Elana Broch, Jesse Rothstein, the College Board, the Educational Testing Service, and the NSCE institutions for data; Alexandria Walton for her research assistance; and Melanie Adams, Judith Tilton, and Kristen Turner for administrative support. *Direct all correspondence to Thomas J. Espenshade, Office of Population Research, 249 Wallace Hall, Princeton University, Princeton, NJ 08544-2091; e-mail: tje@princeton.edu.*