The Winner-Take-All High School: Organizational Adaptations to Educational Stratification

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Across the United States, families seek schools with reputations for academic excellence for their children, assuming that such schools improve a talented child's prospects for college admission. This article shows that students from "star" public high schools experience a disadvantage in entering elite colleges that stems from the attention played to class rank. In response, some high schools have developed "winner-take-all" characteristics, enhancing the success of their top students at the expense of other students. Students below the top of their class do less well than would be expected in terms of grades and advanced placement courses. They also take fewer advanced math and science subjects, given their high academic skills, compared to equivalent students in less prestigious schools. These patterns are linked to a system of educational stratification that links colleges and high schools through several types of assessment games.

American culture stresses the importance of education for social mobility. Hence, many families respond with strategies for enhancing their children's educational prospects. One strategy is to search for new homes close to academically superior public schools. Countrywide, this strategy results in high concentrations of affluent families clustered in school districts with reputations for academic excellence.

A second strategy is to send children to private "prep schools" that are known for their academic eminence (Cookson and Persell 1985, Powell 1996). A third strategy prevails in certain cities where elite public high schools recruit talented students through competitive examinations.[1] Taken together, these three patterns have generated a system of roughly 200 "star" high schools in the United States with national reputations for exceptional educational outcomes.[2]

Although parents choose star schools for the rich educational experiences they provide, most assume that a major advantage inheres in their preparing students for entry into the nation's most selective universities. Going to a star high school is believed to improve a talented child's prospects for getting into the best colleges, a step on the way to the most sought-after careers.

This article examines the organizational dynamics of these exceptional high schools and the colleges to which they send their best pupils. My central thesis is that star high schools are caught in an assessment system in which top students vie for entry into selective colleges. Many schools adapt to this system, seeking to maximize the chances of their strongest students. *Some* of these schools have developed policies that resemble "winner-take-all" markets: Their strongest students benefit at the expense of those below (Frank and Cook 1995). I build a case that

1. The reputation of a star school becomes tied to the attainments of its academically strongest students, but may be bought at the cost of reduced opportunities for the talented graduates who are below the top.
2. Attempts to "game" or manipulate the selective college entrance system have led to modifications in the grading systems that are used by many star high schools that further distance their top students from all the other students.
3. In some star schools, this effort has led to changes in curriculum that lower the involvement of highly talented students in rigorous courses, especially in math and science and in advanced placement (AP) courses.

In sum, there is an irony. In many cases, the hopes that draw families to enroll their children in star public schools tend to backfire for all but the top-performing students. As I demonstrate later, formulas used by elite colleges in the admissions process, especially an emphasis on class rank in high school, create a higher hurdle for students who are educated in public high schools where there is a high concentration of talented young people in one school. Students who have excellent test scores and high grade point averages (GPAs) from rigorous courses but are not at the top of their class are downgraded by these formulas. For such students, entry into elite colleges from star public schools requires higher test scores than entry from elsewhere.

Faced with the difficulty of getting their strongest students into selective colleges, star public schools have adapted. Many have implemented internal grading systems that give greater prominence to the achievements of their top students. Some star high schools also "cream off" the best of their students, discouraging with tough grading policies all but the strongest students from taking AP examinations, especially for more rigorous courses in math and science. Such adaptations ensure that the best students in star schools stand out from the rest, enhancing their chances in the stiff competition for the most selective colleges. The adaptations unfortunately have negative consequences for the remaining ranks of students in these high schools.

CONCEPTUAL BACKGROUND

Stratification via Bureaucratic Statistics

In our highly bureaucratic society, decisions about resource allocation are increasingly based on quantitative measures of performance generated by organizations (Attewell 1986). Corporations collect statistics on revenues from local branches to decide which to expand and which to shrink. Colleges evaluate applicants using SAT scores, GPAs, and class rank, among other factors. Prospective students, in turn, read handbooks that rank colleges on quality and selectivity.

Of course, quantitative measures or rankings are not the sole criteria on which decisions are made. Many decisions hinge on nonnumerical judgments. However, in a world dominated by rationalistic or economic ideas, quantitative assessments of performance, or deciding among alternatives according to their scores or rankings, have a broad appeal. A major advantage of such measures is that they appear to provide an unbiased decision-making method.

Publicly available performance measures take on a coercive aspect. Important outsiders can hold institutions to account when measures decline over time, when one organization ranks below another, or when decisions seem unfair (DiMaggio and Powell 1983). Consequently, performance measures become powerful incentives for action. Individuals and organizations change their behavior to look as good as possible on the numbers, in a process known as *gaming* (Blau 1955). I describe instances in which organizations provide certain information but conceal other data, create new measures that will highlight certain performances at the expense of others, and filter out data from poorly performing individuals—all to improve the educational organization's profile.

The larger point, however, is that the educational field is increasingly structured by *assessment games,* in which organizations and individuals seek to maximize their standing on these measures. Assessment procedures, in this case those developed by Ivy League colleges, come to have implications not only for the students who seek entry into those colleges, but for the reputations of colleges themselves and for high schools. In gaming the admissions process for their strongest students, star high schools have affected the educational climate of the majority of their students, even those who do not aim to go to highly selective colleges. Assessment games that originated in one institutional sphere have come to structure the internal workings of another.

Winner-Take-All Markets

There are winners and losers in all competitive markets. Some sellers find that their goods are more desirable and command a better price, while others cannot sell their goods at all or have to discount their price steeply to sell them. In economic theory, such competition and unequal outcomes are viewed as efficient mechanisms for allocating scarce resources and matching supply and demand.

Frank and Cook (1995) coined the term *winner-take-all markets* for a subspecies of markets in which competition takes on a different character. In these special markets, sellers whose goods are viewed as the best (or are thought of as the top performers) reap far greater rewards and capture a disproportionate share of the market than do other sellers whose goods are also of high quality. Sellers immediately below the top may perform almost as well as those at the top, but gain far fewer rewards. In Frank and Cook's example, a handful of top opera tenors command high fees for performing and recording, while artists who are technically close to them remain obscure, are paid far less, and are rarely asked to record. Similar behavior is found among top athletes (where the competitor who came in fourth is barely acknowledged), as well as among law firms and authors. In such cases, reputation is central to the dynamics of the market, and reward shares are far more highly skewed toward the top than would be expected, given the "objective" or measurable distribution of talent.

Frank and Cook (1995) view winner-take-all markets as inefficient. The disparities in rewards are far greater than would be needed to attract talented people to participate in these markets. The high rewards at the top lure far more sellers than demand requires, so that the efforts of many unsuccessful but highly talented people are wasted. In addition, the competition takes on a wasteful character, as individuals feel pressure to expend greater and greater efforts to compete, even though the number of winners is not increased by these efforts. Frank and Cook gave as an example that if a few new MBAs feel it advantageous to wear $1,000 suits to job interviews, others feel obliged to do likewise, although this expenditure does not increase the overall success rate in terms of open job slots.

This article demonstrates that some academically outstanding public high schools have come to resemble winner-take-all markets, both in the disproportionate rewards earned by the top few students, compared to similar students of a slightly lower rank, and in terms of increased stratification inside the schools.

The School as a Frog Pond

Davis (1959, 1966) applied the concept of relative deprivation to academic success and motivation, demonstrating the truth in the aphorism: "It is better to be a big frog in a small pond than a small frog in a big pond." He examined the relationships between academic achievement, GPA, and career choice among senior men from colleges with different degrees of academic selectivity. Within any given college, Davis (1966) found that a higher GPA increased the likelihood of choosing a high-prestige career. However, across colleges, *for a given level of scholastic aptitude*, there was a negative association between college selectivity and the choice of a high-prestige career. That is, of two equally able seniors, the one who attended the less selective college was more likely to try for a high-prestige professional career than the one who attended the more selective college.

The mechanism that accounted for this finding was that a student in a more selective college received a lower GPA than a student of equivalent scholastic aptitude in a less selective college. A student who was considered academically outstanding in a less selective college might be viewed as merely adequate in a more selective institution. On average, this lower GPA resulted in lower academic self-esteem and in more humble occupational choices for a given aptitude. Davis (1966:30) concluded: "At the level of the individual [these findings] challenge the notion that getting into the 'best possible' school is the most efficient route to occupational mobility." This article documents a similar phenomenon in today's high schools, but focuses on the organizational, rather than the social psychological, aspects.

METHODS AND DATA

Information on the selectivity and rankings of recent college admissions were obtained from handbooks published annually by Kaplan/Newsweek, Peterson's, Princeton Review, and *US News and World Report.* My description of college admissions draws from books about or by admissions staff (Duffy and Goldberg 1998; Fetter 1995; Hernandez 1997; Paul 1995), from sociological works (Karabel 1984; Karen 1990a, 1990b; Klitgaard 1985), and from historical studies (Geiger 1986; Synnott 1979; Wechsler 1977). I collected data on test scores of high school graduates and their college placements for several star high schools by way of school newspapers, school home pages on the web, school catalogs, and handouts for parents.

Information on the relations between students' SAT scores and patterns of honors courses and AP exams taken were obtained from the College Board, which provided a merged file containing data on all 1,196,213 students in the graduating class of 1997 who had taken any of the following: SAT I, SAT II subject tests, or AP exams (personal identifiers were removed). I aggregated these individual-level data by high school code and cleaned the file to remove home-schooled and non-high school examinees.

Student-Reported Data

Drawn from the SAT Student Descriptive Questionnaire (SDQ), which is part of the College Board data, students' self-reported data on race, religion, parental income and education, and high school GPA were used. College Board researchers have examined the validity of SDQ measures by comparing the self-reports to external administrative records (Freeberg 1988). Variables created from these self-reports included the following:

Race-Ethnicity Dummy variables were created for black, Hispanic, Asian and Pacific Islander, and other race (including Native Americans). White was the reference category used in the regressions.

Parental Education This variable was the mean educational attainment of the respondent's father and mother on a scale of from 1 to 9, from elementary school to graduate degree.

Parental Income This variable was measured by an 11-category scale, ranging from less than $10,000 to more $100,000. Although College Board researchers found a correlation of .78 between students' reports of parental income and data on financial aid applications, patterns of nonresponse dictate caution (Freeberg 1988). I used this variable solely to determine the proportion of affluent parents in a school, in conjunction with parental education (as discussed later), *not* as an individual-level predictor.

Student's High School GPA on the SDQ This variable had 12 response categories, from A+, A, A-, B+, in half grade steps until a final category of "E or F." In the SDQ, each letter grade is accompanied by its corresponding numerical grade (e.g., an A grade is also 93-96). For regression analyses, this variable was reversed, so that a score of 0 indicated E/F and a score of 12 indicated A plus. External verification of self-reported GPAs against high school transcripts revealed good reliability for this measure (Freeberg 1988).

Class Rank Decile This self-report was recoded into a dummy variable with a value of 1 for students who reported that they ranked in the top decile of their high school class, zero otherwise.

Honors Math The SDQ asked for years of course work in mathematics, followed by a yes-no question as to whether the student had taken honors courses in mathematics. This variable was recoded as zero or 1.

Trigonometry Course Work The SDQ asked for the number of years of trigonometry course work, from none to one semester through one to four years. This variable was recoded, with a value of 1 if any amount of trigonometry course work was reported, zero otherwise.

Calculus Course Work Similarly, the number of years of course work in calculus was recoded, with a value of 1 if the student reported one or more semesters of calculus.

Variables from Administrative Records

The College Board file reported the following for each student who took any SAT or AP examination:

Student's Gender Recoded into a dummy with a value of 1 for male, zero for female.

SAT I Verbal Score and SAT I Math Score Each score was measured on a scale from 200 to 800.

Combined SAT This variable was the sum of a student's verbal and math SAT I scores. (The correlation between these two components is about 0.7.)

Sat II Subject Tests Students who had taken three or more examinations out of the 24 possible SAT II subject examinations were coded 1, and zero otherwise. (Three SAT II tests are requested by the admissions offices of many selective colleges.)

Any AP Examination A dummy variable was created with a value of 1 if a student had taken one or more of 33 possible AP subject examinations, and zero otherwise.

AP Math A dummy variable had a value of 1 if a student had taken one or more of the AP mathematics and statistics subject examinations, and zero otherwise.

AP Science A dummy variable was created for students who had taken one or more of 6 AP subject examinations, including biology, chemistry, computer science, and physics. (Psychology and environmental science were not included in this variable.)

School-level Variables

Each senior in the College Board database is identified by a high school code. For school-level analyses, only students who were enrolled in U.S. high schools were included. This process entailed dropping examinees from foreign schools, junior colleges, and "other" codes, as listed in a College Board (1998b) manual.

Certain information, such as the type of school (public, private, or religious), is provided by the College Board database. In addition, I constructed the following three school-level variables by aggregating test scores for students within a school. Only one school-level variable (school percent affluent) entailed aggregating students' self-report data by school.

School Size The database did not provide information on high school enrollment. Instead, a count of the number of SAT-taking seniors in each school was used as a proxy.

School SAT Standard Deviation For each school, I calculated the standard deviation for all 1997 SAT-seniors of their combined SAT I math and verbal scores.

School Percent Affluent For each student, I constructed a dummy variable "affluent," with a value of 1 if either parent had a post-BA education or if the family income was over $80,000. I then aggregated nonmissing responses into a percent affluent variable for each school.

School Percent High Scorers. This variable was constructed by calculating the percentage of SAT seniors in each school whose SAT I math score was 750 or higher. (The math SAT I was chosen because this measure was used primarily to predict who took AP science and math exams.)

School Type I classified schools into five mutually exclusive categories: star private, nonstar private, exam star public, nonexam star public, and nonstar public. Star schools were defined as schools having 11 or more seniors with SAT I verbal scores of 750 or greater.

Modeling Issues

In regression models contrasting school types, I limit the analyses to schools with 40 or more SAT seniors. Thus, all the schools are ones in which a substantial number of college-bound seniors take the SAT. In regressions predicting the probability of taking AP courses from individual or school characteristics, I omit schools in which no SAT student took an AP. Hence, those models predict the proportion of students taking APs, across schools where students do take APs. In the latter part of the article, I present logistical regressions that predict whether a student took, say, an AP exam, using individual students' characteristics and (in some cases) school-level variables as predictors.[3]

My analyses use population data—all students who took the SAT in 1997—not a sample. For this reason, the tables report regression coefficients but not tests of statistical significance. When analyzing population data, one should focus on the sign and magnitude of these coefficients.

FINDINGS

The Concentration of Talent in Star High Schools

Skills of the kind measured by SAT I examinations develop from the interplay of family background, material and cultural resources, opportunities for learning, motivation, and effort. Given the importance of resources among these factors, it is not surprising that a disproportionate number of the highest-scoring students on SATs (or on AP or SAT II examinations) are found in relatively few schools. Nevertheless, the degree of concentration of high scorers is striking.

Nationwide in 1997, the top 0.7 percent of test takers in the graduating class scored 780 or higher on the SAT I verbal test. That year, 81 percent of high schools had no one graduating with SAT I scores this high, and 12 percent of schools had only one person. At the other extreme, 57 schools (0.3 percent of all high schools) each had 10 or more of these high-scoring students, accounting for 11 percent of all high scorers. Broadening the boundary, 217 schools (under 1 percent of schools) graduated 24 percent of these high scorers.

Choosing a score of 780 is arbitrary, but a lower cutoff does not change the pattern: Students at the top of the test distribution remain highly concentrated in a few high schools. Of the schools, 217 enrolled 23 percent of all seniors with verbal SAT scores over 750 and 18 percent of those over 700, for example.

In this article, I refer to these 217 schools as "star high schools," but the term requires careful qualification. As the College Board (1988) noted, SAT and other test scores do *not* measure the performance of any school. The existence of many high-scoring students in a school may reflect the quality of teaching to some extent, but to an even greater extent, it reflects the social composition of the student body and the selection processes that bring students into that high school. However, schools with a high concentration of high-scoring students typically offer advanced courses and send many of their students to the most selective colleges. As a result, parents, staff, and especially college admissions officers view them as extraordinary schools. It is in this sense that I use the label "star."

Of the 217 star schools just mentioned, 67 are private "prep schools" that select students on their ability to pay and on applicants' scores on entrance examinations. The remaining star schools are public. Thirteen of these public schools select students through entrance examinations ("exam schools"). I refer to the 137 others as "star public schools." Most of this last group are in affluent communities and are open to all local residents.

Selective Colleges and Universities

The United States supports about 2,200 four-year colleges and universities, most of which accept almost all applicants who meet certain basic educational requirements. Selective institutions—those with many qualified applicants for each opening—are a small minority (Bowen and Bok 1998). There is a spectrum of selectivity: The most sought-after Ivy League colleges report about 8 applicants for every undergraduate opening, while a few dozen selective state universities typically report from 1.5 to 3 applicants per undergraduate admitted. The rest have close to one qualified applicant for every place in the freshman class (see Table 1).

Scholars have documented that the "market" for colleges has become increasingly polarized in recent decades. Already highly selective colleges have experienced greater increases in applicants than have less-selective colleges (Duffy and Goldberg 1998). This increased polarization reflects a widespread belief that a student gains a lifetime advantage if she or he gets into a top college (Karabel and Astin 1975). As economists put it, there has been a "flight to quality." This tendency is especially marked among the highest performing students (Cook and Frank 1993; Hoxby 1997; McPherson and Shapiro 1998).

Bowen and Bok (1998) found that graduation from the most selective colleges was a great advantage in terms of entry to elite professional schools and long-run posteducational incomes, *net of* a student's initial academic performance or skills (SAT and GPA). Thus, the economic payoff to a given academic ability is greatly enhanced by entry to a highly selective college (see also Kingston and Smart 1990; Loury and Garman 1995; Zweigenhaft 1993).[4]

Most researchers focus on the period before and during World War II as central to understanding current private college orientations. After World War II, the SAT became widespread as a yardstick for assessing college entrants. By taking this one examination, students could apply to multiple colleges. In 1959, the College Board published its first application and admission figures for colleges, and by the early 1980s, commercial publishers provided comparative ratings for prospective students as part of guides for

Table 1. Selectivity of Some Colleges and Universities

Institution	% of Applicants 1980	Accepted in 1998	25th and 75th Percentile Scores for SAT Verbal in 1998	
Harvard	16	13	700	790
Princeton	20	12	670	770
Stanford	19	15	670	770
Yale	20	18	670	770
Dartmouth	23	22	660	760
Chicago	66	58	640	740
Duke	37	30	640	730
Northwestern	55	29	620	720
Vanderbilt	67	58	590	680
Ann Arbor, MI	72	69	590	660
Austin, TX	74	61	540	650
Berkeley, CA	70	36	570	700
Chapel Hill, NC	46	37	560	670
Madison, WI	83	77	520	650

Sources: *Peterson's Annual Guide to Undergraduate Study* (1982) and *Kaplan's College Catalogue* (1999).

Note: The admissions data refer to undergraduate applicants, and the SAT verbal scores refer to those entering the freshman class.

choosing a college. These publications came to list the SAT test-score profile of each college's entering class, the ratio of applicants to admissions, and the proportion of students drawn from the top 5 percent or 10 percent of their high school classes, as well as more qualitative information about each school. Today, these annual publications are best-sellers. (The best-known ones are the annual *US News and World Report* issue on colleges and similar guides by Kaplan, Peterson's, and Princeton Review.)

These measures have developed into an iron cage, constraining colleges and creating incentives to look good on the measures. Students typically apply to colleges whose mean SAT scores approximate, or are somewhat higher than, their own scores (Chapman and Jackson 1987). Colleges that have refused to report statistics for publication have experienced disastrous declines in the number of applicants, leading them to provide data in subsequent years (Duffy and Goldberg 1998). Performance statistics, now made public, have increased stratification among colleges. The top ones, all private, are swamped with applicants, but nevertheless remain sensitive about their standing relative to one another. Many other private colleges struggle to find enough paying customers, despite reputations for excellence in teaching.

To thrive, today's private colleges need to present evidence of their selectivity and performance to potential students and their families. Admissions staff therefore strive for (1) a student body that is drawn from all parts of the country, (2) a large pool of applicants from which the college accepts a small proportion (selectivity), (3) maintaining high academic standards for the incoming class in terms of SAT scores and high school class rank, and (4) maintaining the college's standing vis-à-vis competing elite colleges. This last criterion is represented bureaucratically by the "yield"—the proportion of accepted students who actually come to the college instead of going to competing colleges.

These measures may be gamed or manipulated, given that colleges provide data about themselves to the publishers of college guides. The reported SAT scores may not include those of athletes and other lower-scoring persons, and applicant-to-admit ratios may be inflated by overcounting those who applied (Duffy and Goldberg 1998; Fetter 1995). Selectivity or admissions ratios depend on the effort expended on mailings and visits by college representatives to high schools. There is a strong incentive for colleges to drive up the number of students who apply without changing the number admitted, in order to appear more selective. Colleges whose SAT profiles are not strong may also attract talent by offering scholarships to high performers (merit scholarships.) The income from high tuition may be recycled to offer scholarships to applicants whose high scores will make the school seem more desirable (Duffy and Goldberg 1998, McPherson and Shapiro 1998).

The Selection Process in Elite Universities

The college admission process has been subjected to considerable scrutiny. Few scholars doubt that there was ethnic and racial discrimination in the past (Duffy and Goldberg 1998; Geiger 1986). In reaction, admissions offices nowadays have explicit policies that are designed to prevent bias. Several admissions officers from selective colleges have allowed studies of their procedures or have written books about the process themselves (Fetter 1995; Hernandez 1997; Paul 1995; cf. Karen 1990a, 1990b; Klitgaard 1985).

At an early stage, candidates' application materials are typically coded into two numerical scores, one representing academic achievements and the other representing extracurricular activities (Fetter 1995; Paul 1995). These numerical scores are modified during a series of readings by admissions officers, using their judgment of the toughness of a student's choice of courses and other information. Review committees choose perhaps one in six applicants out of a pool that has already been filtered to contain only good prospects.[5]

In their writings, admissions officers take great pains to explain that their decisions are as fair as possible, stating that they are constrained by standardized procedures and shielded from outside influences (Fetter 1995). I accept that officers are unbiased, but argue that the initial scoring scheme nevertheless disadvantages certain kinds of applicants. The calculation of academic standing from SATs and class rank, which is often performed by computer according to a standard algorithm, is the point at which students who attend star high schools initially become disadvantaged. This calculation requires no attitudinal bias on any staff person's part.

An Admissions Algorithm and Simulation

Hernandez (1997), the assistant director of admissions at Dartmouth College, detailed the "Blue Book" algorithm used there and in other Ivy League colleges to calculate an academic index (AI) for comparing students' applications. She reported that there is a high degree of agreement between admissions decisions using this method and decisions made by other highly selective colleges that use the same basic inputs but in a slightly different way.

The formula calculates an AI by combining three components: SAT I scores, SAT II scores, and the student's *class rank* in his or her particular high school.[6] The last is called a "converted rank score" or CRS. It drops off steeply as one moves down from the head of the class.

Table 2 presents a simulation using the Ivy League admissions algorithm. In each of three panels, I grouped hypothetical students from different high schools who have *identical* SAT scores. The students differ only on their rank in their school's graduating class. I utilized the algorithm to calculate the AI for each hypothetical applicant and the likelihood of being accepted into the freshman class at Dartmouth College, using a translation from AI values to admissions probabilities reported by Hernandez.[7]

The simulations show that using class rank in combination with SAT scores creates a dramatic valedictorian effect. Being at the top of one's class is worth about 70 points on the SAT I plus 60 points on the SAT II in terms of outcome (compare valedictorian G to student B in Table 2). However, this class-rank benefit is extended only to the top handful in a high school class (compare G with H and D with E). Conversely, the simulation shows that there is a substantial *disadvantage* of being below the top of one's class. Even having very high SAT scores and an excellent GPA will not help if a substantial number of students rank higher in one's high school class (compare student C to A, D, or G).

In effect, the Ivy League algorithm treats every school in the United States as equivalent, so that a student at the 95th percentile in his or her high school class rank would receive the same CRS score, no matter what school he or she attended. This equivalence is especially questionable for star high schools, where the distribution of students' talent differs dramatically from the U.S. distribution. Using the SAT I verbal score as a yardstick for purposes of illustration, one can see how extraordinarily aberrant star schools are compared to typical high schools. In Table 3, the first column presents the published national SAT I verbal score distribution for all students

Table 2. Simulated Effect of the Admissions Formula and the Likelihood of Acceptance to an Ivy League School

Student	SAT I	SAT II	Class Rank	AI	% Accepted
A	770	760	1	233	94
B	770	760	10	224	76
C	770	760	25	220	52
D	750	740	1	229	94
E	750	740	5	224	76
F	750	740	20	217	52
G	700	700	1	221	76
H	700	700	5	215	25

in the class of 1997 (College Board 1999). This distribution could be imagined as the SAT profile of a quintessentially average high school. The second column reports the actual SAT distribution for one star public school that accepts all children in an affluent suburb. The third column shows the distribution for an urban exam star public school.

Table 3 indicates that nationwide, 1 percent of the takers of the SAT I verbal scored 760 or over, compared to 7.4 percent at the suburban star school and 28.9 percent at the exam-based public school. In terms of the SAT I, the 29th-ranked student in the exam school performed as well as the 9th-ranked student in the suburban star school and as well as the top-ranked student in the average high school. Yet because of the class-rank part of the Ivy League algorithm, the valedictorian at the average school would receive 170 more SAT-equivalent points than the 29th-ranked student at the exam star high school, despite their both having identical SAT scores and (potentially) similar grades.

A multivariate analysis of students in the College Board database confirms this case-study finding (see Table 4). The model predicts whether a student is in his or her school's top decile in class rank from the student's SAT I scores and type of high school attended. The odds of being in the top decile for a student in an exam star public school was only 24 percent of the odds of a student with the same SAT scores from a nonstar public school (the reference category). The odds of a student from a nonexam star public school being in the top decile was 30 percent of the odds of an equivalent-scoring student in a nonstar public school. In sum, academically strong students attending star schools

Table 3. SAT I Verbal Distributions for the Graduating Class at Three Schools

	"Average High"		"Affluent High"		"Exam High"	
SAT I Verbal	*N*	%	*N*	%	*N*	%
790–800	2	0.7	14	5.2	34	20.0
760–780	1	0.3	6	2.2	15	8.9
740–750	1	0.3	8	3.0	18	10.4
720–730	3	1.1	10	3.6	27	15.6
700–710	4	1.5	8	3.0	15	8.4
Under 700	256	95.8	221	82.7	63	36.6
Total	267	100.0	267	100.0	172	100.0

Note: "Average High" is a fictional school whose SAT distribution is set to the national SAT distribution. The other two schools are real.

Table 4. Logistic Regression Predicting Rank in Top Decile

Predictor	*B*	Exp(*B*)
SAT I verbal	0.0051	1.0051
SAT I math	0.0091	1.0092
Star exam	-1.43	.238
Affluent star	-1.17	.309
Prep star	-1.59	.202
Nonstar private	-.429	.651
Constant	-9.03	
N of cases	837,845	
Nagelkerke *R*-squared	0.39	

Source: College Board 1997 college-bound seniors file.

have a substantially lower class rank than do their counterparts with identical SAT scores in nonstar schools (cf. Davis 1966).

By constituting one-third of the overall AI from class rank, the Ivy League admissions procedure imposes a large penalty on many students in star schools. 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, in terms of the AI, than if they received the same SAT scores and GPAs while attending a less selective high school. This is the "Big frog in a small pond or small frog in a big pond" phenomenon (Davis 1966, Frank 1985).

Other things being equal, the disadvantage of being in a star high school is worse, the more intellectually exceptional its student body. For example, in 1998, Stuyvesant High School in New York City had 11,397 eighth-grade applicants for its 850 high school places (Bumiller 1998). Admission was strictly on the basis of a special entrance examination, which is considered tougher than the SAT. The ratio of admissions to applicants to this public high school—a selectivity of 7.5 percent—was considerably higher than for the most selective universities (cf. Harvard at 13 percent).

It is not surprising, then, that the graduating class of Stuyvesant seniors (like those from other exam and star schools) contains an astonishing number of gifted students. This concentration of talent makes class rank highly misleading compared to a nonselective school. As the principal put it: "[Class rank] doesn't make any sense when you have dozens and dozens of kids with a 97.2 average" (Bumiller 1998). All but the top handful of these "dozens and dozens" would receive a low converted rank score from the Ivy League algorithm.

The claim that these high schools are disadvantaged in the college admission process may puzzle readers. Star exam high schools are renowned for getting students into Ivy League colleges: Stuyvesant High School noted in the press that from its 700 graduates in 1997, 21 went on to Harvard, 20 went to Yale, 43 went to Columbia, and 103 went to Cornell (Bumiller 1998). Similarly, Hernandez (1997:200) insisted: "[I]t is not harder to get accepted from a strong high school like Stuyvesant because even though Dartmouth receives over one hundred applications a year, it typically accepts 30 to 35 percent, since many are extremely qualified academically."

Nevertheless it *is* harder. The test scores of students who are admitted to Dartmouth (and to other Ivy League schools) from exam schools are substantially higher than the college's norm, as I document later. Conversely, many of the applicants from exam schools who are rejected by elite colleges have substantially higher scores than do students who are admitted to those same institutions from less selective high schools. In essence, the star students who do gain admission do so because their various SAT scores are so high that they more than compensate for the deleterious effects of the class-rank procedure.

This disadvantage can be illustrated by data on admissions and rejections collected from the school newspaper of one exam high school, which I call "Exam High." Year after year, the SAT scores of students who were admitted to each Ivy League college from Exam High were far higher than the median SAT score for the incoming class of that college. In 1998, for example, the SAT scores of accepted students from Exam High exceeded the median score of admitted students to that Ivy League college 96 percent of the time and exceeded the score for the top 25 percent of the college class 58 percent of the time. In other words, Exam High students who were admitted to Ivy League schools typically scored far higher than the average admission. Conversely, many Exam High students who were rejected from Ivy League schools had GPAs and SATs that were well above the median score of students who were admitted from other high schools.

These case-study data complement the simulation model in suggesting that students from high schools with a high concentration of talented students face a higher hurdle to enter elite colleges than do students from less talent-rich schools, although a substantial number of students do leap that hurdle. To reiterate: *This disadvantage is not due to quotas or bias, but to the fact that class rank is used* *in admissions decisions.* An emphasis on class rank makes it harder for a large number of students from any high school to gain admission to a particular elite college. Emphasizing class rank in admissions prevents students from exceptional high schools from dominating any college's admissions pool.[8] However, as I detail later, the class-rank procedure is not applied equally to public and private high schools.

Adaptations by Star High Schools

The Ivy League colleges and universities admit roughly 13,000 freshmen each year, while star high schools alone graduate 56,000 seniors, and a million more college-bound seniors are close on their heels. The result is a recipe for frustration, an arena of fierce struggle among the academically privileged. Faced with this dilemma, star schools exhibit a number of responses:

1. Some high schools try to improve the competitive standing of *all* their graduates vis-à-vis students from other schools. Among other strategies, they encourage their students to take many AP courses and SAT II tests to demonstrate their academic prowess.
2. Many high schools carefully manage the presentation of their institution—the schools' collective statistical "presentation of self"—to improve their students' chances.
3. Some high schools try to lower students' expectations and reduce competition within the schools over admission to first-rank colleges, in part by enforcing an extremely tough grading curve from the freshman year on.
4. Some schools perform a kind of educational triage, focusing on the prospects of their most talented students, knowing that the remainder of their students will still find places at less-prestigious colleges. They keep all but the smartest students out of certain AP and honors courses.

These strategies—documented next—are not mutually exclusive, but I suggest that certain types of star schools tend to emphasize one strategy rather than another.

Raising the Competitive Stakes The College Board's AP examinations provide an opportunity for students to demonstrate that they have learned advanced material during high school and to gain college credit for these courses. They test a student's knowledge in 32 subjects, from art to statistics. Having AP courses on one's transcript fulfills a "signaling" function to college admissions staff and allows students to skip certain college courses and graduate college faster. Adelman (1999) showed that taking AP examinations is a good predictor of the completion of college and that taking a rigorous curriculum in high school is by far the best predictor of success in college. College admissions officers know this.

There has been a marked expansion in the number of high schools offering AP courses and the number of students who take these courses. The College Board (1997) reported that 581,554 students took AP courses in 1997, up from 400,000 in 1992. About 11,500 high schools currently offer AP courses, and roughly 90 percent of U.S. colleges and universities grant academic credit for qualifying AP grades.

It is not only star schools that offer honors and AP courses. Riehl, Pallas, and Natriello (1999) found that urban high schools that serve poor communities place considerable effort and resources into honors courses even when these courses are not heavily enrolled. Honors and AP courses have become important for the academic prestige and legitimacy of all kinds of high schools.

Table 5 indicates that star schools encourage many of their students to take multiple AP courses. However, this effect is by far the strongest in the exam-based public high schools and the prep schools. These schools have the greatest concentrations of high SAT scorers, and their students signal their academic prowess to colleges by taking a large number of AP examinations.

A similar pattern is evidenced by SAT II subject examinations. Most elite private colleges, and some elite public universities, require three SAT II examinations for admission. Hence students who take three SAT II tests may be presumed to have ambitions to

Table 5. Academic and Demographic Profiles of SAT Seniors in 1997, by Type of School

	Nonstar Public	Star Exam Public	Star Affluent Public	Star Prep Private
Mean SAT verbal	497	635	560	631
σ SAT verbal	108	96	113	90
Mean SAT math	503	657	577	636
σ SAT math	109	92	113	85
% Combined SAT				
Score > 1400	3	31	11	23
Score > 1500	0.6	10	4	7
% of Students with				
Any SAT II	16	79	42	81
3 or more SAT IIs	13	63	34	77
% of Students with				
Any AP	27	69	42	67
3 or more APs	2	10	5	10
% of Students Taking				
Honors math	27	46	36	28
Calculus	21	51	29	32
AP math	5	16	8	14
AP science	6	28	11	19
Race				
% black	12	10	6	6
% Hispanic	8	7	5	3
% Asian	8	38	16	11
Family Income				
% > $80,000	25	26	34	65
% < $25,000	21	18	10	6
% of Students with CUM GPA				
A- to A +	37	55	40	42
B- or worse	26	15	22	15
% of Schools with a Tough Grade Distribution[a]	41	15	31	9
N of SAT seniors	823,274	4,360	42,296	10,095
N of schools	8,484	13	137	67

A "tough grade distribution" is defined as 25 percent or more of SAT takers receiving a cum GPA of B minus or worse.

Note: The universe consists of those seniors in 1997 who had taken the SAT I examination. Seniors who did *not* take the SAT are not represented in the data. Private nonstar schools are in the data set but are not shown.

attend elite colleges. For example, 77 percent of SAT seniors in star prep schools had taken three SAT II examinations, compared to 63 percent in star exam schools, 34 percent in star public schools, and 13 percent in nonstar public schools.

A Statistical Presentation of Self High schools expend considerable effort to build a positive image of themselves in the eyes of college admissions officers. 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 (Powell 1996). The school's impression management is cultivated partly by visits with college admissions staff. In addition, many schools prepare annual "fact sheets" about the school that they send to colleges, often attached to each applicant's high school transcript.

A typical fact sheet reports the proportion of the school's seniors who are usually accepted to four-year colleges, the SAT score distribution of the graduating class, the number of students taking AP courses and the AP grades they receive, the number of National Merit Scholarship finalists, and other awards. *These items demonstrate the exceptional academic quality of the school as a whole*. In the past, many fact sheets also reported the mean GPA for the graduating cohort and the grade distribution. The latter information indicates how "tough" a school's grading curve is. It also allows any applicant's GPA to be translated into a class rank. (Some schools directly report class rank on the individual student's record.)

Reporting class rank has been viewed as problematic by staff in star schools for some years. Class rankings make it clear to students in a school that they are engaged in a zero-sum game. They also encourage students' complaints about particular grades and make invidious distinctions between students who are similar in ability. Moreover, some high school principals believed that providing colleges with seniors' ranks disadvantaged them, though they lacked explicit evidence as to how ranking formulas worked. (The use of class ranks in a decision algorithm was a "trade secret" until recently, though the general attention to class rank was not; see Hernandez 1997.)

One adaptation that appears to have become widespread by 1990 is that many high schools abandoned the use of class rank; the schools neither calculated it for internal use nor informed colleges of a student's rank via the transcript. In place of the class rank, some high schools reported class *deciles* so that a student (or a college) knew whether she or he was in the top or second or third tenth of the high school class. However, removing class ranks from transcripts and substituting deciles did not prevent colleges from calculating a pseudo-class rank for an applicant. Hernandez (1997) reported that admissions staff assign any applicant whose transcript indicates that he or she was in the first decile to a rank at the midpoint for that decile. So, in a class of 400, any college applicants in the top decile would be assigned a pseudo-rank of 20. Given the way that CRS scores are sloped, this procedure creates a severe disadvantage for anyone in the first decile whose actual class rank (were it known) is above 20th place.

Some high schools stopped reporting even deciles, but college admissions officers were not stymied. They then calculated pseudo-class ranks using an individual applicant's GPA with the overall distribution of grades reported for the senior class in the fact sheet.[9] However, in the past few years, more and more high schools have also stopped providing that grade-distribution curve to colleges. Here is the explanation on the fact sheet of one star public high school:

> Although [this school] has long had a system of class rank by decile as a way in which to minimize negative competition between and among students, increasingly this system caused problems. The difference between deciles became extremely small, especially in the middle ranges. The School Council feels that the new system will result in a much healthier school climate. The Council further decided not to include histograms or other comparative charts that could easily result in students determining a more absolute class rank.

A school's refusal to provide grade distributions prevents colleges from calculating class ranks, causing one college admissions officer to complain: "GPAs by themselves are not helpful if the college cannot calculate roughly where that GPA would put you in relation to your classmates. . . . When high schools try to withhold information in this way, colleges tend to assume that the high school is hiding something" (Hernandez 1997:61, 52). In these situations of incomplete information, colleges reluctantly calculate CRS points directly from a student's GPA, irrespective of class rank.

Here we see an assessment game evolving between colleges and high schools. Colleges want to rank students against their own high school peers, while high schools want to have their students ranked against the national pool of applicants, irrespective of the achievements of other students in their own high school. The back and forth over reporting or withholding class ranks, deciles, and grade distributions is an informational struggle over how students and schools are to be assessed.

It is important to note that a few high schools have successfully avoided the class-rank issue for years. They have done so by using unconventional grading systems (scales other than 1 to 4 or 1 to 100) and/or "methods that are not specific enough for determining rank." Hernandez (1997:68-69) listed the schools in this special category. They constitute a "Who's Who" of America's leading private preparatory schools, plus a few of the most prestigious star public schools. Evidently, these schools have long avoided the problem of having their many strong students handicapped by the CRS class rank process.

Weighted GPAs Another important strategy adopted by many star schools is the use of a "weighted" GPA. The College Board (1998a) reported that 7 percent of U.S. high schools use this kind of system. Under this system, grades from an honors or AP course are weighed differently in calculating a student's cumulative GPA than are grades from nonhonors courses. For example, the rare student who received all A grades while taking solely honors classes would graduate with a 4.5 average (instead of a 4.0), and a student who graduated with Bs in all honors classes would have a 3.5 average (not a 3.0). *The overall effect is to make the academically most successful students in a school stand out even further from their peers.*

It is noteworthy that weighted GPA systems are widespread among nonexam star public schools, but are *not* found in the exam-based high schools with which I am familiar or in the star prep schools. In both private prep and public exam schools, the variance in academic ability is lower (see Table 5), and there is an ethos that all classes in the school are highly demanding and therefore roughly equivalent (Powell 1996). By contrast, in nonexam star public schools, with a greater degree of academic heterogeneity among students, the rationale *for* weighted GPAs is that students who take honors classes are mastering more difficult material than their peers are. Schools argue that to avoid strong students selecting less-challenging courses in which they could get better grades, the grades in honors courses should be weighted to reflect the extra effort required.

Weighted GPA systems do *not* differentiate courses intended for college-bound students from courses intended for those who will not go on to college. The distinction between honors and nonhonors is *within* college preparatory courses, between the "high flyers" and the rest of the college-bound student body.

Weighting substantially improves the chances of individuals' admission to selective colleges, since it pushes the best students above the 4.0 ceiling that once defined a top performance. It also affects competition between different high schools over their students' entry to selective colleges. For example the *average* GPA for entering freshmen at UCLA is now 4.16, and in 1998, the University of California at Berkeley rejected hundreds of Hispanic and African American students who had 4.0 averages in favor of students with higher GPAs. This practice has led ethnic minorities to cry foul and sue, since poorer schools rarely provide sufficient AP courses to allow even their best students to attain 4.5 averages (Berthelsen 1999; Takaki 1999). This linkage between taking AP courses and the possibility of obtaining higher GPAs has also contributed to a new intensity of tracking within high schools, as I discuss later.

Grading Curve Policies High schools face a balancing act in terms of their course-grading policies. On the one hand, an easier grade curve may help individual students in competition for college places with students from elsewhere. On the other hand, a school that is perceived as too generous in its grade policy ("grade inflation") is thought to lower its reputation in the eyes of college admissions staff, possibly disadvantaging its students.

Table 5 shows that the grade distributions of SAT-taking students vary systematically by school type. *Considering only SAT takers*, star schools, on average, have more generous grade distributions than do nonstar public schools. Exam star schools have the highest grade distributions, followed by star prep schools. Nonexam star public schools are closer to regular public schools in having a tougher grade distribution. The contrasts between types of schools become more marked when subsets of schools that are tough graders are identified. I defined a tough grading distribution to be over 25 percent of SAT takers with cumulative GPAs of B minus or worse. In Table 5, only 9 percent of star prep schools are tough graders, in this sense, compared to 15 percent of exam schools and 31 percent of star public schools.

While Table 5 indicates that star schools have higher overall grade distributions than do nonstar schools, the picture changes once one controls for their students' SAT scores. Table 6 shows that *for a given level on the SAT*, seniors in star public schools have lower GPAs than do their counterparts in nonstar public schools (cf. Davis 1966).

In sum, a student in a star public school is less likely to be in her or his school's top decile and is more likely to have a considerably lower GPA than a student with the same SAT scores who attends a nonstar high school. The implications of this finding, within a winner-take-all framework, are elaborated in the next section.

Academic Tracking Among Strong Students Research on academic tracking in high schools initially focused on the separation of students into academic, general, and vocational tracks. Once assigned to a track, a student took most, if not all, her or his courses with other students in the same track (Kerckhoff 1976; Rosenbaum 1976). Rosenbaum (1979: 223) applied the concept of *tournament mobility* to high schools: "The research revealed a tournament pattern where students who were moved out of the college track any time between 7th and 12th grades had no chance of getting back in that track and very little chance of getting into college, regardless of how hard they strived."

Tracking policies were loudly criticized from the late 1960s on, both for reinforcing social inequality (Oakes 1985) and because research indicated that homogeneous groupings of students according to skill-ability did not improve students' educational performance (Slavin 1990). Many schools apparently responded to such criticism because by 1981, most high schools had abandoned the old system of tracks (Carey, Farris, and Carpenter 1994; Lucas 1999; Moore and Davenport 1988). In its place has emerged a new flexible form of course assignment. Instead of a high school student being assigned to one track for all her or his courses, a student now typically receives individual assignments to courses of different levels of difficulty. Thus, one student may be in honors French, general-level English, and remedial math. *Courses* have become stratified, and "the vast majority of students" take math and

Table 6. OLS Regression of Grade Point Average, Predicted by SAT and Type of Public School

Variable	*b*	Beta
SAT math	.008	.456
SAT verbal	.003	.168
Star exam	-.958	-.034
Affluent star	-.586	-.586
Black	-.002	-.020
Asian	.284	.040
Hispanic	.285	.039
Male	-.776	-.195
Adjusted *R*-squared	.339	
N of cases	806,786	

Source: College Board SAT database for 1997 college-bound seniors.

English courses at different levels (Lucas 1999; see also Garet and DeLany 1988; Stevenson, Schiller, and Schneider 1994).

Lucas (1999) argued that this is inequality in another guise because class, race, and gender remain predictive of course-taking patterns. Adelman (1999) reported that one-third of students who believe they are in a college-prep track are not taking an academic curriculum. Lucas and Good (2001) criticized the tournament concept because they found that nowadays a substantial number of students do move back up into more difficult classes after dropping down; however, they also reported that downward mobility predominates.

This article considers tracking in its newer form, especially the role of AP and honors math and science. While confirming that students' characteristics play a role, I also examine school-level predictors of the relative likelihood of a student taking honors courses.

Useem (1990, 1991, 1992) studied 27 school districts in Massachusetts and documented that districts varied widely in the proportions of students they enrolled in advanced math courses. She noted a steady attrition in the proportions of students in the advanced math track, from 17 percent in the 8th grade to 6 percent in the 12th grade. This pattern resembled tournament mobility within a college-bound student body. Useem discovered two contrasting ideologies about advanced math education and noted that each school district tended to hold one or the other ideology. Teachers in some districts viewed advanced math as requiring exceptional ability and restricted their advanced courses to a small percentage of students. They made it difficult for students to move up into advanced math courses, and even among those who initially entered the advanced track, the number of students who stayed enrolled in advanced math and science classes declined steadily over time between the 8th and 12th grade. By contrast, teachers in the other type of school district viewed mathematics as accessible to many and encouraged more students to attempt advanced courses. They allowed a larger initial enrollment, which persisted over time, resulting in a higher number of students taking calculus in the 12th grade.

Useem reported that affluent communities were more likely to have the second, more inclusive approach, while blue-collar communities tended to be more restrictive. However, some affluent communities shared the restrictive approach with its more rigid tracking or ability grouping. Socioeconomic status (SES) was not the whole story.

The College Board data allowed me to reexamine Useem's findings on a broader scale, looking at school differences in who takes advanced math or science courses, calculus, AP math, AP science, and any AP course. Table 7 presents logistic regression models predicting whether a 1997 senior had taken, for example, AP mathematics, controlling for individual-level characteristics (SAT I verbal and math scores, gender, race, and parental education) and for school type. Table 8 presents an equivalent analysis but for student-reported course work in honors math, calculus, and trigonometry.

Two models, in adjacent columns, are provided for each dependent variable in Table 7. The first column, Model 1, predicts one outcome (e.g., taking one or more AP examinations) from the type of school attended and from the student's demographic characteristics. The second model adds the student's SAT verbal and math scores to the prior predictors. Thus, it adds a control for certain academic skills in addition to school type and demographics. The reader may wish to focus on the columns headed "exp (B)." This measure, e to the power B, is known as the odds ratio. It reports the change in the odds of the outcome (taking the specific AP or honors course) that is associated with a one-unit increase in the particular predictor, after holding all the other predictors constant. For example, in the first model, the odds of a student from a nonexam public star school taking one or more AP examinations is 1.375 times as high as a student of a similar gender, race, and parental education who is enrolled in a nonstar public school (the reference category or yardstick). In the second model, after controlling for SAT scores, the odds of a student in an affluent star school taking an AP examination is .823, or only 82 percent as high as the odds of a demographically similar student *with an equal SAT score* who is enrolled in a nonstar public school.

Table 7. Logistic Regressions: Effect of School Type on Taking AP Examinations

	Took Any AP				Took AP Math				Took AP Science			
	Model 1		Model 2		Model 1		Model 2		Model 1		Model 2	
Predictors	B	exp(B)	B	exp(B)	B	exp(B)	B	exp(B)	B	exp(B)	B	exp(B)
Constant	-2.285		-9.676		-4.093		-10.05		-4.021		-9.911	
Exam star	1.472	4.356	-.110	.896	.798	2.222	-.344	.709	1.226	3.408	.013	
Prep star	1.149	3.155	.093	1.098	.689	1.991	-.033		.675	1.964	-.162	.851
Public star	.318	1.375	-.195	.823	.183	1.201	-.335	.715	.235	1.265	-.275	.760
Private	.101	1.106	-.029	.972	-.001		-.017		-.039	.962	-.116	.891
Male	-.164	.849	-.492	.611	.336	1.400	-.143	.867	.252	1.286	-.057	.945
Black	-.754	.470	.325	1.384	-.666	.514	.401	1.493	-.693	.500	.309	1.362
Hispanic	.401	1.494	1.165	3.205	-.275	.760	.170	1.185	-.290	.748	.157	1.170
Asian	.693	1.999	.821	2.272	.896	2.450	.328	1.389	.931	2.536	.700	2.013
Other race	.039	1.040	.274	1.316	-.093	.911	.026		.086	1.090	.222	1.249
Parental education	.243	1.275	.058	1.059	.167	1.181	-.008	.992	.211	1.235	.025	1.025
SAT math	—	—	.009	1.009	—	—	.015	1.015	—	—	.010	1.010
SAT verbal	—	—	.007	1.007	—	—	-.003	.997	—	—	.003	1.003
N of cases	857,798		857,798		857,798		857,798		857,798		857,798	
R-squared	.108		.398		.051		.241		.069		.232	

Source: College Board database of all 1997 college-bound seniors.

Note: Population: all SAT-taking seniors attending schools with 40 or more SAT seniors in 1997. Reference category for school dummies: nonstar public schools. "Private" means nonstar private schools. Reference category for race: whites.

Table 8. Logistic Regressions: Effect of School Type on Advanced Math Course Work

	Some Calculus Course Work				Some Trigonometry Course Work				Honors Math Course Work			
	Model 1		Model 2		Model 1		Model 2		Model 1		Model 2	
Predictors	B	exp(B)	B	exp(B)	B	exp(B)	B	exp(B)	B	exp(B)	B	exp(B)
Constant	-2.033		-9.705		-.194		-3.487		-1.956		-9.237	
Exam star	1.272	3.570	-.289	.749	1.348	3.849	.486	1.626	.619	1.857	-1.146	.318
Prep star	.849	2.337	-.185	.831	.857	2.357	.267	1.306	.145	1.158	-1.131	.323
Public star	.225	1.252	-.408	.665	.105	1.111	-.186	.830	.186	1.204	-.414	.661
Private	-.002		-.087	.917	.440	1.553	.461	1.586	-.028	.973	-.140	.869
Male	.333	1.393	-.127	.881	.218	1.243	.013	1.013	-.025	.975	-.471	.624
Black	-.599	.594	.655	1.926	-.313	.732	.295	1.343	-.566	.568	.625	1.868
Hispanic	-.156	.855	.446	1.563	-.170	.843	.116	1.123	.000		.634	1.885
Asian	.848	2.335	.705	2.024	.633	1.883	.532	1.703	.589	1.802	.392	1.479
Other race	-.016	.941	.152	1.164	.022		.174	1.190	-.112	.894	.083	1.087
Parental education	.213	1.237	.013	1.014	.134	1.144	.030	1.030	.189	1.209	-.005	.995
SAT math	—	—	.015	1.015	—	—	.007	1.007	—	—	.013	1.014
SAT verbal	—	—	.001	1.001	—	—	.001	1.001	—	—	.002	1.002
N of cases	567,838		567,838		669,853		669,853		857,798			857,798
R-squared	.110		.445		.056		.172		.066			.389

Source: College Board database of all 1997 college-bound seniors.

Note: Population: All SAT-taking seniors attending schools with 40 or more SAT seniors in 1997. Reference category for school dummies: nonstar public schools. "Private" means nonstar private schools. Reference category for race: whites.

A regular pattern repeats across the dependent variables in Tables 7 and 8. In Model 1, in which school type, race, gender, and parental education are predictors, students in star schools are more likely than students in nonstar public schools (the reference group) to take an AP examination, specifically a math or science AP examination, honors math, trigonometry, or calculus. Boys tend to be more likely than girls to take these subjects or examinations (with two exceptions). Whites (the reference racial category) are more likely to take them than blacks or Hispanics. Asians are more likely to take these subjects than whites, and children of highly educated parents are more likely to take them than students with less educated parents.

These findings fit our common-sense impression that star schools are high-powered academically and that gender and race-ethnicity shape students' specialization in advanced science and math. The effect sizes are substantial: Students in star public schools have odds of taking AP ranging from 20 percent higher to 37 percent higher (odds ratios of 1.201 to 1.375).

The impression shifts dramatically, however, in the Model 2 columns. Here, across the same dependent variables, the same predictors are examined, *but now also controlling for an individual student's SAT verbal and math scores*. The signs of many predictors are reversed. Boys are less likely than girls to take honors courses and AP examinations in science and math, *relative to their SAT scores*. Blacks and Hispanics are now more likely to take these advanced subjects than are whites *relative to their SAT scores*. The racial findings are consistent with studies by Gamoran and Mare (1989), Garet and DeLany (1988), Oakes (1985), and Lucas (1999), using different data sets and measures.[10]

Most important for my argument, these regression models indicate that students who attend star schools are considerably *less likely* to take advanced math and science subjects or AP examinations than are students in nonstar public schools, once their SAT scores are controlled. *Relative to their SAT scores*, students in nonstar schools are more likely to take AP math and science than are students in star schools.[11] The effect sizes are substantial: The odds of a student in an affluent star public school taking AP math or AP science are 71-76 percent of the odds of a student of the same demographics and SAT who attends a nonstar public school.

This finding suggests that nonstar schools have a less-talented student mix, but nevertheless tend to push their better students into advanced work. Similarly, minority students whose SAT scores are high for their school but are not on national benchmarks are often encouraged to take honors and AP courses (Riehl et al. 1999). Conversely, star schools have such a rich mix of SAT students that even though they have many students who are enrolled in advanced work, these students tend to have high SAT scores. Students with lower SAT scores, ones that are still high by national benchmarks, are likely to be pushed down to the nonhonors or non-AP level in star schools. Elsewhere, students of this caliber would be near the top of the schools and would likely be tracked into the most advanced courses, but not in star schools.

Useem (1990) captured this tracking phenomenon in a vignette. An adviser in a star school, explaining to a student why he was not selected for the honors math track although he had high scores on a national math assessment, stated: "You're good, but you're not good enough." Mathews (1998:140) noted that one star school "turned down several dozen students who wished to take AP courses. Principal [X] said the policy grew from the school's fear that if too many marginal students took the test, they would lower the school's pass rate and tarnish its reputation with colleges."

Model 2 does not contradict the finding in Model 1 that in sheer numbers and in percentage terms, star schools have substantially more students taking advanced math and science than do nonstar schools. But viewing the data while controlling for SAT provides insight into the dynamics of how markets (or schools) that are rich in talent work: Relative to their ability, many students in talent-rich schools are underchallenged. Here, one again sees the "large frog in small pond, small frog in large pond" phenomenon in operation.

Tracking students away from AP courses may be partly a matter of advising students not to take them, but another mechanism for attaining the same end is adopting a tough grading curve, especially for advanced courses. Students who receive low grades in advanced math and science courses subsequently drop down into less stringent courses and/or shift their focus to the humanities.

Some star schools keep not only potentially failing students out of AP courses, but also students who would probably pass the test. The grade profile of AP grades, especially in science and math, becomes truncated in such schools: The only students who get to take the courses or exams are those who are likely to get top grades. Relatively few students who take AP courses at star schools get modest but passing grades. This tendency to have all AP takers pass with flying colors makes the schools look strong in the materials they send to colleges and is an aspect of the "statistical presentation of self" discussed earlier. But if the point is to avoid AP failures, star schools overshoot and prevent AP passes.

To illustrate this truncation, one affluent star school noted in its information sheet sent to colleges that 93 percent of its students' AP examinations were scored 3 or above and that 50 percent of the AP examinations taken by its students earned the top score of 5. By contrast, at the national level, 64 percent of AP examinations were graded at 3 or better and about 10 percent received the top grade of 5 (College Board 1997:12). Using the College Board database, Table 9 presents grade distributions for several AP examinations, contrasting the grade distribution of AP students in star public schools with those of students in nonstar public schools. The latter are clearly far more likely to let students try and fail or get low passing scores.

Predicting the Winner-Take-All Pattern

The ideal-type of a winner-take-all high school is one that distinguishes between honors and nonhonors courses in its grading policy (by using a weighted GPA system), thus advantaging students who take mainly honors. It limits access to AP and honors courses among strong students, partly through counseling and partly through a tough grading curve. The next task is to identify the characteristics of schools that manifest this pattern and the possible causal mechanisms behind the phenomenon. The explanation I advance has two parts: The first invokes institutional ideologies for certain types of schools, and the second tests competing sociological hypotheses in predicting dimensions of the ideal type.

Two kinds of star schools largely avoid the winner-take-all pattern. Private prep schools—even those that enroll academically outstanding students—seem resistant to the tendency. As Powell (1996:172) noted:

> Challenge is . . . sustained at the [elite Prep] high school level by a serious but limited curriculum and by requirements that substantially restrict student choice. Fewer courses and fewer options create a relatively egalitarian student experience. The curriculum does not

Table 9. AP Grade Distributions in Two Types of Schools (%)

	Affluent Star	Nonstar Public
AP U.S. History		
% grade 5	18	9
% grade 1–2	28	66
AP Math AB		
% grade 5	19	10
% grade 1–2	23	47
AP Chemistry		
% grade 5	27	10
% grade 1–2	23	50

Source: College Board data for all SAT seniors in 1997.
Note: AP grades go from 1 to 5, with 5 indicating the best performance.

> function to widen the aptitudinal and motivational differences students inevitably bring to their studies: its function is the reverse. Schools can show parents who are paying the same price that their different children are receiving the same service. One benefit of economic privilege is greater equity in access to a challenging curriculum.

Despite their poorer and more ethnically diverse student bodies, urban exam public schools share this approach with their prep school brethren. Exam public schools are "purposeful educational communities." Their students chose to apply and then were selected on the basis of their performance on demanding examinations. Upon this base of shared ability and commitment, an institutional ideology of uniqueness and superiority developed. Having defined their students as an elite, exam schools treat all their scholars as capable of taking rigorous programs.

"Constrained curriculum" is another phrase used to describe schools with a limited curriculum of demanding academic courses that almost all students take (Lee, Croninger, and Smith 1997). Such a pattern characterizes prep, exam, and Catholic schools. It has been shown to be associated with students' higher performance in math (Lee et al. 1997; see also Gamoran 1992; Jones, Vanfossen, and Ensminger 1995).

By contrast, among academically heterogeneous public high schools, the winner-take-all pattern tends to emerge, but even in these schools, it is not ubiquitous. I advance four alternative hypotheses for where and why this pattern may emerge among nonexam public high schools:

Hypothesis 1: Winner-take-all traits increase with school size. As organizations grow larger, they increase their internal specialization and differentiation. Hence, *ceteris paribus,* the separation of college-bound students into multiple tracks ("top flight" versus "others") should increase with school size.

Hypothesis 2: Winner-take-all traits increase with greater heterogeneity in students' ability, as measured by the variance in test scores in a school. Tracking may emerge as a functional response to widely varying students' abilities, from the belief that it is more effective to teach students who are grouped according to similar ability than to teach mixed-ability classes (a belief disputed by Slavin 1990). So winner-take-all may be a response to students' intellectual heterogeneity.

Hypothesis 3: Winner-take-all traits increase with the school's proportion of affluent professional parents. Parents who hold professional jobs may be highly concerned with access to elite colleges because they recognize the mobility advantages provided by Ivy League credentials. As baby boomers, they have experienced the highly competitive labor markets that accompany large birth cohorts, and they may transfer that insecurity into concern about their children's prospects (cf. Easterlin 1987). In public high schools, some educated affluent parents exert influence to increase their children's opportunities because they view their own children as "special" (Lareau 1989, Useem 1991). One institutional response to "specialness" is to provide different classes that are reserved for the most gifted students. Thus, winner-take-all tracking may grow out of this class-linked parental pressure (cf. Kohn 1998). Alternatively, professional parents may fear that their children's education will suffer if they are in classes with lower-class children and may push for tracking to obtain SES homogeneity in the classroom (Oakes 1994a, 1994b).

Hypothesis 4: Winner-take-all traits increase with increasing proportions of very high-scoring students. Frank and Cook's (1995) model suggests that winner-take-all stratification is associated with a glut of talent seeking high rewards for success. Applying this framework to education, the more academic talent in a school, the greater the likelihood that a school will skew its rewards toward its strongest students. Merely smart students will be left on the educational sidelines.

In Table 10, these four hypotheses are tested simultaneously through student-level logistic regressions predicting taking any AP examination, taking an AP math examination, or taking an AP science examination. The population is all students in nonselective public schools with

40 or more SAT takers. To facilitate comparisons across the four hypotheses, I standardized all variables (except dummies) with a mean of zero and a standard deviation of one. Thus, the odds ratios—exp(B)—represent the change in the odds of, say, taking an AP examination associated with a one-standard deviation increase in each predictor.

The models in Table 10 include student-level controls (sex, race, parental education, and SAT scores), but the focus is on the school-level characteristics. Hypothesis 1 proposed that increased school size should be associated with *decreases* in the likelihood of taking an AP, net of other factors. This hypothesis finds little support: In the case of any AP, school size has no discernable effect. In the case of AP science, it has a *positive* association. Only with regard to AP math is the hypothesis supported: Students in larger schools are less likely to take AP math, net of their general scholarly ability.

Hypothesis 2 posited that academic heterogeneity would be associated with a lower probability of taking an AP, holding a student's ability constant. Here, too, the effects are mixed. For AP math, the hypothesis is supported, but for any AP and AP science, the effect is reversed: The likelihood of taking these subjects is increased in a more heterogeneous school.

Hypothesis 3 suggested that students in schools with higher percentages of affluent parents (here defined as the percentage of students whose parents have a post-BA education or a family income of over $80,000) would be less likely to take AP subjects, net of personal attributes and other school characteristics. One mechanism for this outcome would be if professional parents pressed for school policies in which higher-SES or more gifted children tend to take different classes from their lower-SES or less-gifted schoolmates. The hypothesis is supported: In each case, the greater presence of affluent parents in a school is significantly associated with the lower likelihood of taking AP, after individual students' SAT scores, sex, race, parental education, and for other school-level variables are controlled.

Table 10. Logistic Regressions: Testing Hypotheses Regarding School-level Correlates of AP Exam Taking

	Any AP		AP Math		AP Science	
Predictors	B	exp(B)	B	exp(B)	B	exp(B)
Constant	-1.382		-3.844		-3.425	
Male	-.494	.610	-.153	.859	-.067	.935
Black	.329	1.389	.428	1.535	.297	1.345
Hispanic	1.210	3.355	.261	1.298	.192	1.212
Asian	.897	2.451	.443	1.557	.753	2.123
Other race	.293	1.341	.050		.233	1.262
Parental education	.158	1.172	.034	1.035	.073	1.076
Verbal SAT	.789	2.202	-.296	.744	.287	1.332
Math SAT	.972	2.644	1.721	5.588	1.125	3.079
School size	.002		-.098	.907	.059	1.061
School SAT *SD*	.053	1.055	-.065	.937	.056	1.057
School % affluent	-.099	.906	-.087	.917	-.092	.912
School % high scorers	-.073	.930	-.056	.946	-.061	.940
N of cases	736,670		736,670		736,670	
R-squared	.390		.243		.232	

Source: College Board 1997 college-bound seniors.

Note: Population: All SAT-taking seniors in schools with 40 or more SAT takers. Variables: except for race and gender dummies, all variables are standardized with a mean of zero and an *SD* of 1.

Hypothesis 4, the winner-take-all hypothesis, suggests that the greater the proportion of very high-scoring students, the greater the internal stratification and exclusion in a school, leaving a substantial number of strong (but not as outstanding) students out of the running. This hypothesis is also supported. In each case, the presence of higher proportions of top-scoring students is associated with a lower likelihood of taking AP, after SAT, personal, and school-level characteristics are controlled.

In sum, a pattern was described earlier for star public schools in which their student bodies were less likely to take AP examinations and advanced math and science, controlling for their general academic skill level as measured via SAT scores. Table 10 suggests that this observed pattern is more prevalent in schools with higher proportions of gifted students and in schools with higher proportions of affluent families. Both these factors are independently, and roughly equally, associated with a lower-likelihood of an AP pattern.

Table 11 translates the logistic models into probabilities of taking various AP subjects. The probabilities reported are for white male students of average parental education. The table contrasts probabilities for schools that differ on the percentage of high-scoring students and the percentage of affluent parents. It also contrasts strong, very strong, and outstanding students, as measured by their SAT verbal and math scores in standard deviation units. The school effects on AP are substantial for all types of students and all three subjects, but the effects are the largest for exceptional students in AP math. Such a student has a .42 probability of taking AP math if he attends a school below the mean in terms of the percentage of high scorers and affluent families, compared with a probability of .30 in a school with many very high scorers and affluent families.

Table 11. Influence of High-Scoring Students and School Affluence on the Probability of Taking Any AP Exam, an AP Math Examination, and an AP Science Examination

School Characteristics: % High Scores and % Affluence	Probability of AP for a Strong Student	Probability of AP for a Very Strong Student	Probability of AP for an Exceptional Student
Probability of Taking Any AP Examination			
1 *SD* below the mean	.51	.86	.94
At the mean	.47	.84	.93
1 *SD* above the mean	.43	.81	.91
2 *SD* above the mean	.39	.79	.90
2.5 *SD* above mean	.37	.77	.89
Probability of Taking the AP Math Examination			
1 *SD* below the mean	.08	.26	.42
At the mean	.07	.23	.38
1 *SD* above the mean	.06	.21	.35
2 *SD* above the mean	.05	.19	.32
2.5 *SD* above the mean	.05	.18	.30
Probability of Taking the AP Science Examination			
1 *SD* below the mean	.13	.37	.55
At the mean	.11	.34	.51
1 *SD* above the mean	.10	.31	.47
2 *SD* above the mean	.08	.27	.43
2.5 *SD* above mean	.08	.26	.41

Note: A strong student means SAT I scores 1 *SD* above the mean, a very strong student means SAT I scores 2 *SD* above the mean, and an exceptional student means SAT I scores 2.5 *SD* above the mean.

Source: Calculated from Table 10 logistic regressions.

CONCLUSION

The larger purpose of this article is to integrate a series of disparate phenomena—admissions formulas for elite universities, grade and tracking policies in top high schools, the surge in AP examinations, and the attrition of able students from advanced math and science courses. Scholars have previously studied these phenomena separately. I have sought to show that they may be fruitfully considered as interlocking aspects of one assessment system.

That system is driven by competition for scarce resources. At the college level, the resource is reputation, which, in turn, affects the number of applicants and hence the financial viability of private colleges. At the high school level, reputation also looms large: School staff are convinced that their school's reputation affects the ability of their strongest students to gain admission to the most sought-after colleges. So some schools limit access to AP and other advanced courses to "sure bets" and adopt grading policies that distance top students from their fellows, while maintaining a "tough" grading curve. At the student level, there is a sequence of scarce goods: The opportunity to obtain a high GPA, which is related to access to honors courses, struggles over class rank (a zero-sum resource) and ultimately access to elite colleges en route to a career.

All the actors in this system, individuals and organizations alike, are caught in a system of assessment games. That some of the institutions originated the assessment procedures does not matter. They are now caught in a system in which a college's reputation will dip if its selectivity or test-score profile changes and a high school will lose face if it ceases to send enough of its best students to top colleges.

Faced with the existence of this system, actors try to do as well within its boundaries as possible. They game the system. Colleges encourage a larger number of applicants, and high schools keep their grade curves tough and their AP pass rates high to emphasize their seriousness of purpose, but refuse to report class ranks. High school students craft a balance between taking demanding courses and participating in extracurricular activities to impress college admissions staff. They avoid courses that may lower their GPAs.

Weighted GPAs, which at first appear to be esoteric accounting devices, turn out to allow exceptional students to leap to extraordinary heights of GPA, outdoing others who merely have 4.0 averages, in the intense competition for selective colleges. Grade systems with weighted GPAs make AP examinations take on a whole new aspect. No longer just a way of jumping over college requirements, in some schools AP courses have become a gateway to exceptional grades and thus top colleges. This situation disadvantages poorer schools that do not offer lots of AP courses and places their students at a disadvantage GPA-wise.

In some star public schools, access to the honors track has become limited to the cream of the cream. Accomplished through advising and tough grading policies, this new form of tracking leads to a steady attrition out of advanced math and science courses, causing experts to wonder why talented young Americans avoid these subjects.

The intense competition among colleges sustains a form of stratification that is transferred into high schools with many talented students. The result resembles a winner-take-all market. Each year, from a large pool of able students, a handful goes on to top colleges. But both the lucky ones and the "also rans" experience a kind of academic speedup in their high schools, an unanticipated consequence of stratification among colleges and the educational assessment games that follow. The human costs at the high school level of this interlocking system have yet to be documented, but are likely to be severe.

Stratification in America is not solely a matter of distancing the affluent from the poor. As this study demonstrated, stratification processes also affect advantaged strata. In an educational equivalent of the "tragedy of the commons," affluent parents, in seeking exceptional high schools to advantage their children, fuel organizational practices that rebound negatively on many of their own offspring.

NOTES

1. Some examples are the Stuyvesant and Bronx Science public high schools in New York City, the Boston Latin School in Boston, and Lowell High School in San Francisco.

2. A preliminary definition of the term *star high school* is a school from which many graduates are admitted to selective colleges. I use the term *star*, rather than elite, because some of these schools serve nonaffluent urban student bodies. An operationalization of *star school* is detailed in this article. Mathew's (1998) book *Class Struggle* presents a list of star schools.

3. Multilevel data of this type are sometimes analyzed using hierarchical linear modeling (HLM). The logic for using HLM is that the standard errors estimated by traditional "level 1" (logistic or OLS) models are inaccurate owing to clustering. The slope estimates for predictors are almost identical in HLM and in conventional regression models (Bryk and Raudenbush 1992). The data used in this article are a census covering an entire population of over 1 million cases. There is no sampling of students within schools, and all students have an equal probability of entering the sample (a probability of 1). Hence the issue of avoiding deflated standard errors—the primary rationale for HLM—is moot for this data set. Standard errors and tests of significance for estimates are appropriate for analyses of samples, not for populations. Given this context, I have opted to use logistic regression models (not HLM) so that the effects of individual and school-level characteristics can be straightforwardly compared in one model.

4. This more recent research differs from earlier studies summarized by Pascarella and Terenzini (1991) and Astin (1993) that found only minor differences in economic attainment associated with the quality or exclusiveness of the undergraduate college or university attended after students' precollege socioeconomic characteristics were controlled. Dale and Krueger (1999) also reported finding no income payoff to attending a highly selective college. However, their analyses included two predictors: SAT selectivity and the average real cost of attending (with financial aid subtracted). The former variable was not a significant predictor of postgraduation income, net of the second. However the second predictor was both significant and substantively important. One may interpret Dale and Krueger's findings as follows: The degree of academic/SAT selectivity of a college is not what predicts high postgraduation incomes, but attending an expensive college, where a high proportion of students pay full tuition, pays off handsomely. One sociological interpretation would be that it is not the intellectual but the SES exclusivity of a college that is associated with higher income.

5. There are separate considerations for minority applicants and for children of alumni. Athletes are also treated in a special way. Applicants in these categories have a clear advantage in terms of their chances for admission. These preferences clearly offend some critics' sense of equity, but are defended by admissions officers and college presidents, including Bowen and Bok (1998). However "preferences" are not a concern of this article. I focus on the dynamics applying to "ordinary" applicants, especially those from star high schools.

6. High school GPA does not contribute directly to the AI. It has an effect only when it is used to calculate the rank of each student relative to his or her high school classmates.

7. The simulation does not deal with the extracurricular activity score that admissions officers use, in conjunction with the AI, in admissions decisions. In effect, that score is held equal for all applicants in this table.

8. The origins of the emphasis on class rank are to be found in the 1920s, when an anti-Semitic panic swept the Ivy League universities, resulting in the adoption of various exclusionary devices. After World War II, when formal quotas against Jews were dropped, the use of class rank became linked to pressures for geographic "diversity" that prevented urban public high schools with concentrations of academically gifted Jewish students from dominating Ivy League admissions. Nowadays, urban Asian students are similarly affected by class rank. See Wechsler (1977), Synnott (1979), Karabel (1984), and Klitgaard (1985) for this history.

9. Hernandez (1997) included charts for calculating rank from these pieces of information.

10. It is possible that taking AP courses may raise a student's academic skills and thereby improve her or his SAT scores. However, this kind of reverse causation from AP to SAT would not obviate the results reported here regarding the influence of school type on AP enrollment.

11. The results of the regressions were confirmed by cross-tabulations, which indicated the percentage of students at a given SAT level who took a given AP or honors course across high school types. These tables are available from the author on request. They confirm that the multivariate findings were not due to modeling artifacts.

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