Grade Inflation for Top California Students by High School Affluence

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If more-affluent high schools inflate their top students' grades more than less-affluent schools over time, then grade inflation could exacerbate socioeconomic stratification across universities. This topic brief describes trends in top-performing students' grades at more- and less-affluent California high schools between 2003 and 2011. While more-affluent schools award higher grades than less-affluent schools on average, there is no evidence of greater grade inflation in more-affluent schools at the top of the grade distribution. In fact, the gap between top students' grades at more- and less-affluent schools actually shrank during the period, and the persistent gaps across schools can be explained by test score differences. GPA-inflating AP and IB course enrollment, however, has long expanded much faster at more-affluent schools. The evidence suggest that grade inflation has likely not hindered lower-income students' access to the University of California.

Introduction

College students are highly stratified across universities by family income, with students from higher-income families enrolling more at more-selective universities, and this stratification is an important contributor to the intergenerational transmission of income. As a result, there has been substantial recent attention on the various factors used by selective universities to choose their students, with particular interest in identifying factors that may give an unfair edge to affluent applicants.

High school grade point averages (GPAs) are a key factor in most selective universities' admissions decision-making. Median high school grades have been trending upward across the country since at least the mid-1990s, and the trend appears more severe at affluent high schools (Gerchenson 2018; Hurwitz and Lee 2017). If high school grades provide an increasing advantage to affluent applicants to selective research universities, then current admissions practices could further exacerbate socioeconomic stratification across universities by decreasing less-affluent applicants' likelihood of admission to selective universities.

Most selective university students were near the top of their high schools' grade distribution, where grade inflation patterns may differ from those experienced by median students. Most university admissions offices also consider specially-calculated weighted GPA measures in place of students' simple overall GPA. For example, each of the nine undergraduate University of California campuses treat students' “weighted a-g course GPA” as one of the fourteen factors used to admit undergraduates, restricting the GPA calculation to specifically-designated core `a-g' courses (like history and English) and ‘weighing’ UC-certified honors and college-level courses more heavily by awarding them an additional grade point. As a result, previous measures of grade inflation trends may differ from the trends that are relevant to selective universities' admission decisions.

This brief presents grade inflation statistics calculated for most California high schools between 2003 and 2011 by the University of California Office of the President (UCOP).[2] Each summer, each high school provided UCOP with the student transcripts of the top 10 percent of its incoming senior-year students by overall GPA. UCOP then calculated an admission-relevant weighted GPA using only 11 core courses taken

in the sophomore and junior year -- two years of English and Mathematics, one year of History, Lab Science, and Non-English Language, and four other UC-approved courses -- and determined the school's 96th percentile of grades.

Data

While the student transcripts used to calculate schools' 96th percentile grades (along with the originally-calculated thresholds) have been destroyed, we reconstruct the 96th percentile weighted GPA at each school using contemporaneous UC admissions records.[3] Each public high school is then matched to its 2007-08 free and reduced price lunch recipience rate to characterize the relative affluence of each school, and each public and private school is characterized by the median family income and average SAT score of University of California applicants to the school, overall and among applicants close to the school's 96th percentile.[4] Private high schools are categorized as Catholic or non-Catholic on the basis of an augmented text match with a complete list of California Catholic high schools.[5] In order to balance the panel, we omit schools that open or close during the sample period or do not have estimable ELC GPAs for more than one year across the sample period.[6]

Table 1: *Sample Selection and Descriptive Statistics*

	All CA Schools	ELC Schools	Balanced Sample
# of Schools	2,172	1,420	957
Avg. 96th %ile GPA		4.03	4.04
Med. Fam. Income ($)	69,000	67,000	69,000
Near 96th %ile		72,300	74,700
Avg. SAT Score	1662	1667	1692
Near 96th %ile		1758	1789
Public High Schools			
# of Schools	1,213	980	724
Avg. # of Students	1,450	1,702	2,028
Avg. % FRPL	42	42	39
Private High Schools			
# of Schools	959	440	233
% Schools Catholic	13	24	39
% UC Applicants Cov.	100.0	97.4	87.8
% Pub. HS Stud. Cov.	100.0	94.9	83.5
% Priv. UC App's Cov.	100.0	87.4	74.0

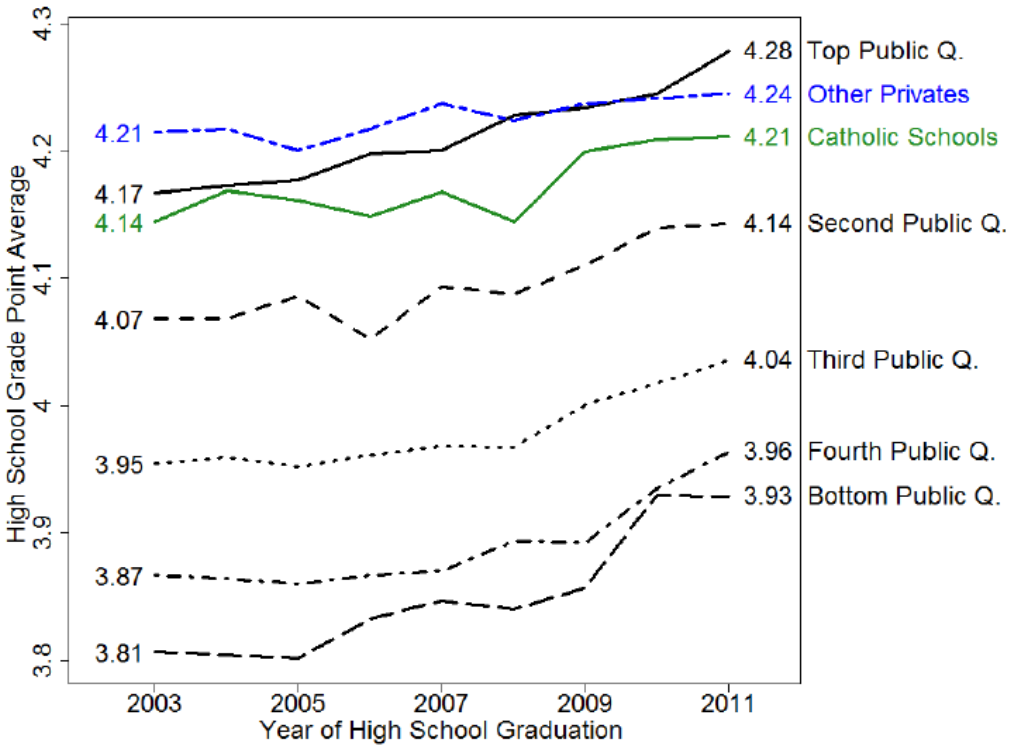
Note: Descriptive statistics of all California high schools, schools that participated in the University of California's Eligibility in the Local Context (ELC) program, and schools with observable ELC eligibility thresholds in every year between 2003 and 2011. Average SAT score and family income from among UC applicants; 'near 96th percentile' restricts to applicants within 0.3 GPA points of their school's ELC eligibility threshold. Applicants with unobserved family income are assumed to have above-median family incomes. School number of students and free and reduced price lunch recipience only observed for public high schools; reported statistics from 2007-2008. Catholic schools identified by text match with complete school list available from Wikipedia. The bottom three rows show the percent of UC applicants, all public high school students, and private high school UC applicants who were enrolled at schools in the given sample. Public high school statistics matched by CDS code. High-school-level family income statistics originally produced by the UC Office of the President for institutional research purposes; see Bleemer (2018b).

Source: UC Corporate Student System and CA Department of Education

Table 1 presents descriptive statistics of the full and restricted samples of California high schools. Of the 2,172 high schools that graduated California students between 2003 and 2011, only 1,420 ever participated in the ELC program, but those schools enrolled 95 percent of public high school students and over 97 percent of University of California applicants, a useful proxy for the pool of students who could enroll at selective universities. These schools have an average 96th percentile weighted GPA of 4.03, with average median family incomes of $67,000 and average SAT scores of a 1667 out of 2400. Students near their schools' 96th percentile thresholds are positively selected, yielding somewhat higher average family incomes and SAT scores. The average proportion of students eligible for free and reduced price lunch (FRPL) across schools is 42 percent.

Restricting to the balanced sample of ELC-participating schools drops the sample to 957 schools, but these schools enroll almost 90 percent of students who applied to the University of California in the period. Coverage of private university UC applicants is somewhat lower, at 74 percent. Nevertheless, the sample covers the large majority of California high schools weighted by student population, including 724 public high schools and 233 private high schools. The balanced sample appears relatively representative of the unbalanced sample in terms of observable characteristics, though there is some evidence that the balanced

Figure 1: *Average 96th Percentile of Grades by High School, 2003-2011*



Note: Annual mean 96th percentile of grades for California public high schools by quintile of the inverse of free and reduced price lunch recipience, and for Catholic and other private high schools; the top quintile of public schools has the highest share of higher-income students (and thus the lowest share of FRPL recipients). Balanced school sample construction presented in Table 1. FRPL is measured in 2007-08 and linked by CDS code. Source: UC Corporate Student System and CA Department of Education

sample is slightly positively selected; the schools have higher average SAT scores by 30 points and lower average FRPL by 3 percentage points.

Results

Figure 1 shows the annual average 96th percentile of grades from 2003 to 2011 at seven groups of high schools: public high school quintiles by (the inverse of) free and reduced price lunch (FRPL) recipience, Catholic high schools, and non-Catholic private high schools. “Top Public Q.” refers to the most-affluent high schools, as measured by having the lowest FRPL levels. The chart's most notably feature is the distinct ordering of public high schools: more-affluent high schools' top students have uniformly higher average grades than top students at less-affluent schools, ordered from first quintile (4.21 average GPA in 2003) to fifth quintile (3.81 average GPA). In 2003, top students at Catholic high schools had similar average grades to those at the top quintile of public schools, while top students at non-Catholic private schools had even higher grades than the top public quintile. These differences in 2003 grades could reflect either past grade inflation or real performance differences across the schools.

Figure 1 also shows stark evidence of grade inflation at the top of the grade distribution across California high schools. Top students at the top quintile of California public schools were averaging 0.11 more grade points in 2011 than they were in 2003. But average grades among top students from the bottom quintile of public schools rose even faster, from 3.81 to 3.93. The middle three quintiles all rose between 0.07 and 0.09 points, suggesting widespread grade inflation across public high schools. Interestingly, grade inflation was much lower at non-Catholic private high schools, where top students' grades were surpassed by those of the top public school quintile in the late 2000s; the private high schools' top students' grades only increased 0.03 points between 2003 and 2011, to 4.24. Catholic schools' grades rose 0.07 points.

Table 2 presents linear regression estimates of the relationship between top students' grades and high school affluence over time, estimated across California high schools.[7] The first column defines affluence across public high schools by their FRPL recipience. The baseline coefficients confirm that all California public high schools have experienced gradual grade inflation and that high-FRPL (low-affluence) schools assign lower average grades to top students. Interestingly, the interaction term between time trend and affluence implies that less-affluent schools actually experience slightly *faster* grade inflation than more-affluent schools: top students' grades at schools with 20 percent higher FRPL recipience tended to increase an additional 0.012 points every ten years.

Table 2: *Grade Inflation over Time by High School Affluence*

	96th Percentile of Grades			
Year	0.010	0.011	0.006	0.007
	(0.001)	(0.001)	(0.001)	(0.001)
% FRPL	-0.566		0.010	
	(0.029)		(0.030)	
% FRPL × Year	0.0060		0.0051	
	(0.0032)		(0.0030)	
Med. Fam. Inc. (Stand.)		0.168		0.028
		(0.006)		(0.006)
Med. Fam. Inc. × Year		-0.0016		-0.0019
		(0.0006)		(0.0005)
Avg. SAT /1000			0.842	0.755
			(0.025)	(0.020)
# of Obs.	6,444	8,489	6,444	8,489
Mean of Y	4.01	4.04	4.01	4.04

Note: OLS linear regression estimates of California high schools' 96th percentile of grade point averages on interactions between year (2003-2011) and two non-time-varying measures of affluence: 2007-08 percent of students receiving free or reduced price lunch (FRPL) and the median CPI-adjusted family income of 2003-2011 University of California applicants within 0.3 GPA points of their school's 96th percentile GPA (standardized across school-years in the balanced sample). Average SAT score covariate measured as the average SAT score of UC applicants within 0.3 GPA points of their school's 96th percentile GPA in each year. Balanced school sample construction presented in Table 1. FRPL is restricted to public high schools and is linked by CDS code. Applicants with unobserved family income are assumed to have above-median family incomes. Standard errors are clustered by high school. Estimates including high-school-level family income statistics originally produced by the UC Office of the President for institutional research purposes; see Bleemer (2018b).

Source: UC Corporate Student System and CA Department of Education

The second column defines high school affluence by the median family income of 2003-2011 UC applicants near their schools' 96th grade percentile, a single affluence measure that covers both private and public high schools. Incomes are standardized across the balanced sample. The interaction term implies that top students' average grades at schools with one standard deviation lower median family income rise by about 0.016 additional points each 10 years, a modest difference across schools that statistically rejects the hypothesis that top students' grade inflation is greater at more-affluent schools.

Discussion

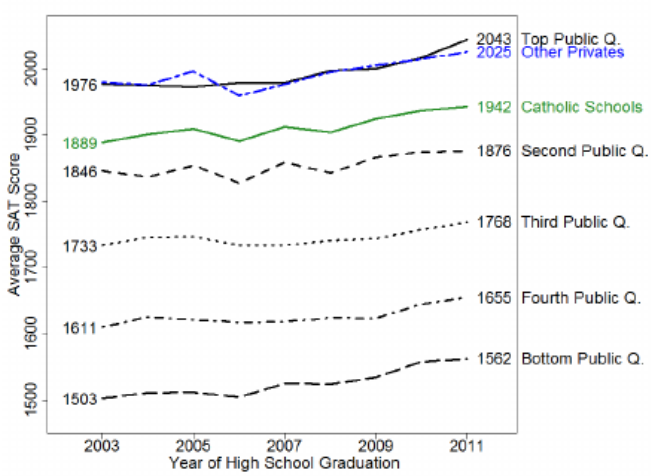
Grade inflation for top students at California high schools appears to be rising at a similar pace across more- and less-affluent public schools, with slightly lower rates of grade inflation at the state's more-affluent private schools. This small but statistically-significant difference in grade inflation rates by school affluence could arise for one of at least three reasons:

1. Top students' actual academic performance could be improving faster at less-affluent schools.

2. Teachers at less-affluent schools could be increasingly generous in their grading relative to more-affluent schools.

Figure 2: *Average SAT Scores of Top Students by High School*

(a) *Average SAT Scores of Top Students*



Note: The annual average SAT scores of UC applicants within 0.3 GPA points of their school's estimated 96th percentile ELC threshold, averaged by high school and then by either FRPL quintile (public) or whether the school is Catholic (private). Sample restricted to balanced sample described in Table 1. FRPL is restricted to public high schools, is observed in 2007-08, and is linked by CDS code. Catholic schools identified by text match with complete school list available from Wikipedia. Source: UC Corporate Student System and CA Department of Education

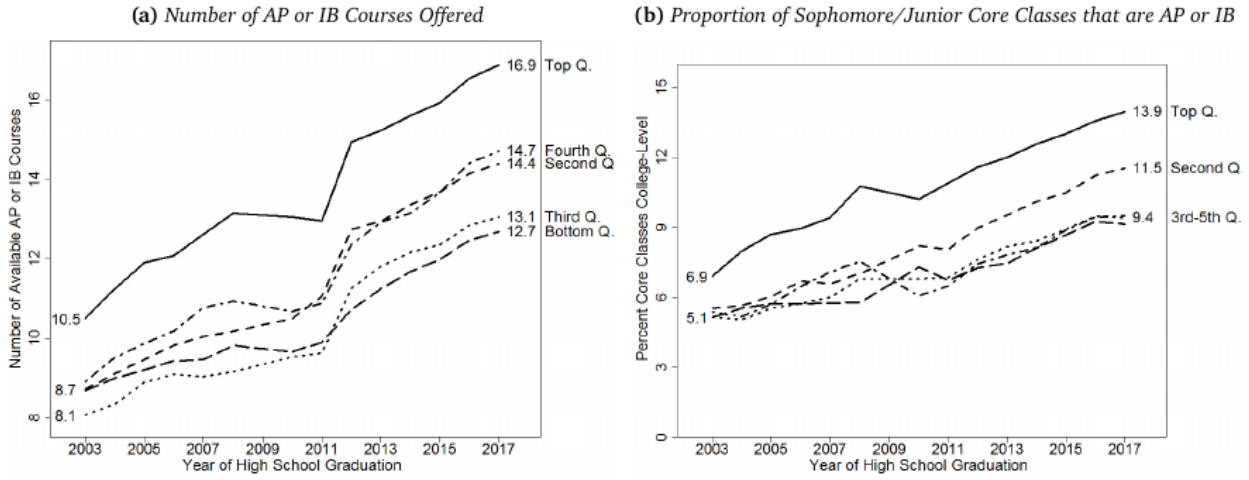
3. Top students at less-affluent schools could be increasingly enrolling in honors and college-level AP and IB courses relative to more-affluent schools, increasing their grade point averages with the weighted GPA point bonuses provided in those courses.

The first explanation can be tested in part by analyzing whether less-affluent schools' top students' grade inflation can be absorbed by those students' improved SAT scores. Figure 2 shows that average SAT scores (converted to the 2400 scale) are indeed rising across all categories of California high school, with particularly large increases at top-quintile (+67 points) and bottom-quintile (+59 points) public high schools.

The third and fourth columns of Table 2 show increases in top students' SAT scores are indeed strongly correlated with those students' grades; an increase in average SAT scores by 100 points is associated with a 0.08 increase in GPA. Moreover, cross-high-school differences in top students' average SAT scores can almost wholly account for differences in average grades across high schools, and explain about 40 percent of overall high school grade inflation. However, changes in SAT scores are shown to hardly explain any of the estimated difference in grade inflation between more- and less-affluent high schools; holding test scores fixed, the relationship between school affluence and grade inflation remains largely unchanged in both specifications.

Finally, Figure 3 presents evidence suggesting that increases in college-level course-taking at less-affluent schools is also unlikely to explain those schools' slightly higher level of grade inflation. The figure, constructed with course-level data from the California Department of Education, presents (a) the annual

Figure 3: *Availability and Prevalence of College-Level Courses at Public High Schools*



Note: Left: The average annual number of distinct AP or IB courses offered at each public California high school, averaged by high school and then by FRPL quintile. Right: The annual proportion of sophomore- and junior-year core course enrollments – including English, History / Social Studies, Science, Mathematics, and Foreign Language – that were in AP- or IB-designated courses, averaged by high school and then by FRPL quintile. Both: Sample restricted to balanced sample described in Table 1. FRPL is restricted to public high schools, is observed in 2007-08, and is linked by CDS code. Source: UC Corporate Student System and CA Department of Education

number of available AP and IB courses and (b) the proportion of all sophomore- and junior-year core course enrollments that were in AP- or IB-designated classes, averaged by public high school quintile.[8] The latter panel shows that college-level course-taking has persistently expanded faster at top-quintile and second-quintile high schools than at lower-quintile high schools since 2003, by 7.0 percentage points at top-quintile high schools relative to 4.3 percentage points at bottom-quintile schools. Changes in the total availability of AP and IB courses has followed a similar (though somewhat-noisier) trend. Though these charts are not restricted to 96th-percentile students, they suggest that college-level course enrollment among top students is unlikely to have grown at a faster rate at less-affluent high schools relative to more-affluent schools.

While these findings suggest that increased relative teacher generosity at less-affluent is the most likely cause of those schools' slightly higher grade inflation between 2003 and 2011, but the question remains open to further research.

Conclusion

If grade inflation among potential selective university enrollees were more rampant at more-affluent high schools than at less-affluent schools, then the resulting potential distortion of university admission decisions in favor of higher-income applicants could possibly be cause for concern. Prior research focused on unweighted overall median grade point averages suggests that grade inflation is exaggerated at more-affluent schools. However, this brief shows that the choice of a GPA measure more relevant to selective university admissions decisions -- up-weighting honors and college-level courses and focusing on college-preparation sophomore- and junior-year courses -- as well as a more-relevant distributional moment (the 96th percentile) shows that grades actually rose slightly more at \textit{less}-affluent California high schools

between 2003 and 2011. Indeed, even static grade gaps between high schools appear to be almost wholly explained by actual educational differences as captured by standardized test scores. This evidence suggests that grade inflation does not provide a growing (or even static) concern with regard to socioeconomic stratification at American universities.

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[2] 96th percentile GPA estimates were calculated the University of California's Eligibility in the Local Context program (Bleemer 2018), a top percent policy designed to guarantee UC admission to the top four percent of students at each California high school. While high schools could choose whether to participate in the ELC program, the fact that ELC provided admission guarantees for students at every participating high school strongly incentivized participation, which exceeded 98 percent among public high schools and 78 percent among private high schools by 2003 (University of California 2002).

[3] In particular, Bleemer (2018) observes the specially-calculated ELC GPA for every UC applicant along with their high school and their eligibility status (that is, whether their ELC GPA is greater than their high school's threshold). These are used to estimate the GPA location of each threshold, usually the highest GPA such that there are no ELC-eligible students from that school-year with lower ELC GPA's than it.

[4] Data are available here. Schools are matched by CDS code. Applicants are considered 'close to' their high school's 96th percentile if their ELC GPA is within 0.3 GPA points of the estimated threshold.

[5] Categorization available here.

[6] A school's ELC GPA cannot be calculated if the applicant pool across all nine UC campuses from that school-year does not include at least one ELC-eligible student and one ELC-ineligible student with a calculated ELC GPA, or if the school did not participate in ELC in that year.

[7] The regression model is:

$$G_{st} = \beta_1 Y_t + \beta_2 A_s + \beta_3 Y_t A_s + \beta_4 X_{st} + \epsilon_{st}$$

where G_{st} is the 96th percentile of grades at high school s in year t, Y_t is the year, and A_s is one of two measures of school affluence: the proportion of students receiving FRPL in 2007-08 or the standardized CPI-adjusted median family income of 2003-2011 UC applicants within 0.3 GPA points of their school's 96th percentile threshold. Applicants with unobserved family income are assumed to have above-median family incomes. X_{st} is either null (columns 1-2) or the average SAT score of UC applicants within 0.3 GPA points of their school's 96th percentile GPA in t (columns 3-4).

[8] Core courses include mathematics, science, English, social studies, history, and foreign language.