Preliminary and Incomplete

High School Quality, Race, and College Achievement

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Introduction

This paper uses unique and rich data sets on enrollees from the University of Texas at Austin and Texas A&M-College Station to examine an important question: How does high school quality and race/ethnicity affect college achievement at selective universities? Several concerns emerge when addressing this question. First, if elite institutions receive the bulk of their applications from students who attend high quality secondary schools, then how much quality variation is there to exploit? Second, there are issues of selection bias. Suppose that only truly exceptional students from high schools of low quality attend selective institutions and perform well academically. This could lead to the naive conclusion that the quality of high school attended does not matter much.

Texas's experience with Affirmative Action provides an opportunity to address the question. The decision in *Hopwood v. Texas* ended the use of race and ethnicity as factors in both the admissions decision and the financial aid decision. Kain et al. (2005) report that in the two years following the *Hopwood v. Texas* decision the mean number of black and Hispanic high school graduates from Texas enrolling as freshmen at the University of Texas at Austin and Texas A&M-College Station Texas's declined by 28 percent and 14 percent, respectively. To reverse the decline in minority enrollment at Texas's elite public institutions, the Texas legislature passed *House Bill 588* or the Top Ten Percent Rule. The Top Ten Percent Rule grants automatic admission to any public college or university in Texas for Texas high school graduates who both finish in the top decile of their graduating cohort and submit a completed application for admission to a qualifying postsecondary institution within two years of graduating.[1]

[1] *House Bill 588* also allows each public college or university in Texas to annually determine if it will offer automatic admission to graduates in the top quartile and provides each institution with a list of eighteen factors that can be used in making admissions decisions

Under the Top Ten Percent Rule, students who qualify for automatic admissions are granted admission irrespective of standardized test scores, the relative quality of the curriculum, or the quality of the high school. Montejano (2001) finds that the number of high schools sending students to the University of Texas at Austin increased from 622 high schools in 1996 to 792 high schools in 2000, a 27.3 percent increase. He states that most of the increase comes from schools that sent low numbers previously. Dickson (2006) provides evidence that the Longhorn Opportunity Scholarship Program increased the set of students that are interested in attending Texas who are from high schools with few students who attended the University of Texas prior to the program. Domina (2007) finds that *House Bill 588* increased flagship enrollment rates at marginalized high schools in Texas. Texas's alternative to Affirmative Action increased the enrollment of students from low performing high schools and provides a chance to better estimate the impacts of high school quality.

Fletcher and Tienda (2008) show that the inclusion of high school fixed effects that black-white differences and Hispanic-white differences in several measures of college achievement disappear. In this paper, I examine how race and high school quality impact performance. As such, in the estimating procedure I include some proxies for high school quality—for example, the percentage of students who attempt an admissions examination and the average SAT score of the high school. I posit that schools where students are taking admissions exams at a high rate are indicative of an environment where kids are interested in post-secondary opportunities and that schools with higher average SAT scores are higher quality schools. This approach is likely to reveal information on how background affects performance as Rothstein (2004) demonstrates that the ability of SAT scores to predict first semester grade point average is reduced when high school demographics are

if a student does not qualify for automatic admissions included in the specification. I am motivated by the patterns in Table 1 and Table 2. The gaps in college academic performance appear in the first term and are increasing. This pattern is true for my samples across both institutions.

Understanding the factors that influence performance is important. There is much disagreement about who merits the opportunity to attend a selective institution. However, conditional on a student being enrolled, the institution should want the students to do well. This paper provides information on the latter.

Data

The data is derived from the administrative data from the University of Texas at Austin and Texas A&M-College Station. These data sets provide information on the enrollees' semester-by-semester GPAs, cumulative GPAs, the choice of Major, etc. The data sets contain information from the enrollee's application. There is variation across the two institutions in the items that are contained in the applicant file; however, both files contain data on the enrollees' race, gender, standardized test score performance, and data on Advanced Placement courses.

I merge in public high school level data from the Texas Education Agency's Academic Excellence Indicator System. In particular, I am interested in obtaining two measures, the percentage of the high school's graduates who attempt an admissions examination and the mean SAT score of a high school for a given academic year. I also merge in zip code level data from the 2000 Census. This data was matched with the zip code of the enrollee's high school. The measures used in this paper include the fraction of the population that is unemployed in the high school's zip code as of the year 2000 and the fraction of the population with at least a bachelor's degree in the high school's zip code as of the year 2000.

I limit the sample to enrollees that were successfully matched with both high school and zip code information who were enrolled in either the University of Texas at Austin or Texas A&M-College Station for at least six terms and no missing values for any of the variables used in the analysis from the years 1992–2002. This leaves me with 20,424 enrollees from the University of Texas and 20,238 enrollees from Texas A&M that I examine in each of the six terms.

Methodology

The goal is to determine if minority/white gaps in college performance are impacted by high school quality. I exploit the richness of the enrollee data sets to test these hypotheses. I estimate variants of cross-sectional models of the following form:

$$GPA_{i(T)} \;=\; \alpha + \; X'_{i(s)}\beta_1 \;+\; Q'_{i(s)}\beta_2 \;+ \sum_j \gamma_j D_j + \; \varepsilon_{i(T)}$$

$GPA_{i(T)}$ is the grade point average of enrollee i in Term T. The terms α and $X_i'\beta_1$ are a constant and the product of the controls $X_{i(s)}$ and the effects of the controls on the outcome,β_1. $X_{i(s)}$ contains person specific characteristics-for example, standardized test scores-and high school specific information—such as, the fraction of the population that is unemployed in the high school's zip code. The term $Q'_{i(s)}\beta_2$ represent the effects of the measures of high school quality for school s in the year student i enrolls in college on the grade point average in term T. The term $\sum_j \gamma_j D_j$ measures the magnitude of the gaps in academic performance between group j and the excluded category in Term T. The excluded category are students who identify as being white. The standard errors are clustered at the high school level to deal with the inference issues raised by Moulton (1990) and Bertrand et al. (2004).

I first estimate the models without the quality measures and examine the values of $\widehat{\gamma_j}$, the estimated effects of race on grade point average in term T. I then include the measures of high school quality and observe how the coefficients associated with category j change.

I use this simple specification to examine how the measures of quality affect the outcome of interest and to examine how quality affects the estimates of the various minority/white gaps in performance across terms. There are issues with this approach. First, I limit the specification to simply including the measures of high school quality linearly without interactions. The effects of high school quality could vary by race. If this is true, then leaving out the the interactions implies that the $\widehat{\gamma_j}$'s are some weighted average of the unexplained gap in academic performance and the various interactions. I leave this to future work.

Second, I estimate a series of models that are cross-sectional in term T. The models are estimated on individuals in the sample in term T across the years of the sample. Estimating the models in this fashion implicitly assumes that college performance is independent across terms. There are factors that affect the college performance across terms—for example, a traumatic event can affect performance for several terms. I leave it to future work to deal with the issue of the correlation of errors across the terms.

Results

Table 3 contains the summary statistics for the samples for both institutions. The average SAT scores of the students in the sample is 1217 for the University of Texas at Austin and 1170 for the Texas A&M-College Station. These scores are in line with the SAT of the average freshman admitted to either institution. Demographically whites comprise most of the samples across both universities especially at Texas A&M. However, the distributions of the minorities are quite different. The black share is similar across both institutions as is the share of Hispanics. Asians comprise a much larger share of the sample for the University of Texas at Austin. The measures of school quality. Students come from high schools where the majority of students attempt admissions. In addition, the average SAT scores of the high schools of the students in the sample are in excess of a thousand. I am examining selective institutions, so it isn't much of a surprise that the mean quality measurements are high.

Table 4 and Table 5 contain the results of the estimates for the first two terms. The results are qualitatively and quantitatively similar across terms. Examining the estimation results from the first two terms is sufficient.

I first discuss the results in Table 4. Males in this sample receive an average score that is, on average, .18 points less that of females in the first term. This effect is unchanged with the addition of the quality measures. In the second term, males perform an average of .22 points worse than females, ceteris paribus. The estimated differences remain stable with the addition of the quality measures. The magnitude of these estimates is similar to the estimates obtained by Fletcher and Tienda (2008).

The black/white differences, the Hispanic/white differences, and the Asian/white differences are much smaller than the estimates reported in Fletcher and Tienda (2008). The black/white difference is -.07 points without the addition of the quality measures and -.05 points with the addition of the high school quality measures. The Hispanic/white difference is -.07 points without the addition of the quality measures and -.06 points with the addition of the quality measures in the first term. The differences are smaller but the pattern remains the same in the second term. Again, the estimates are robust to the inclusion of the quality estimates. The Asian/white difference is .03 points without the addition of the quality measures and is .03 points with the addition of the quality measures. In the second term, Asian/white difference is .04 points without the addition of the high school quality measures and .03 points with the addition of the high school quality measures. All the estimated effects are significant at the five percent level.

The estimates of the direct effects of the average high school SAT score are an order of magnitude smaller than the effects of a student's own test score, have the wrong sign and are statistically insignificant. The effects of a change in the percentage of the graduates at the enrollee's high school that attempted an admissions exam has the expected sign and is statistically significant at the five percent level.

Table 5 contains the estimates for the first term grade point average and second term grade point average at Texas A&M-College Station. Males in the sample who are enrolled at Texas A&M-College Station have grade point averages that are on average .15 points lower than comparable females, ceteris paribus. The estimated difference remains the same with the addition of the high school quality measures. In the second term, males on average have grade point averages that are .19 points lower than a comparable female conditional on the covariates. This estimate does not change with the addition of controls for high quality and are similar to the Fletcher and Tienda (2008) estimates.

Similar to the results in Table 4, the minority/white differences are relatively small. The black/white difference is -.04 points without the quality controls and is -.03 points conditional on the other covariates in the first term. The magnitude of the differences increases slightly in the second term. The estimated black/white differences are -.05 points without the addition of the quality controls and -.04 points with the addition of the quality controls. However, the set of black/white differences aren't statistically significant.

The conditional Hispanic/white differences are -.06 points in the first term without the controls and -.05 points in the first term with the addition of the quality controls and are precisely estimated. The magnitude of the differences increases slightly in the second term. The conditional Hispanic/white differences are -.08 points in the first term without the controls and -.08 points in the first term with the addition of the quality controls and are statistically significant at the five percent level.

The conditional estimates for the Asian/white difference is .04 points in the first term, with and without the inclusion of the quality measures. The estimate of the Asian/white increase slightly in the second term to .05 points, and remains unchanged with the inclusion of the quality measures. The estimates are significant at the five percent level.

The effects of the high school average SAT are small and statistically insignificant across the first and second terms. The effects of the percentage of the the graduates of the enrollee's high schools that attempted an admissions exam are statistically significant in the first term, but the magnitude of the estimate falls by half and it loses significance in the second term. In both cases, the estimates are qualitatively small.

The pattern persists across the terms. I find racial and ethnic differences in performance that have the expected but are smaller in magnitude. The measure of high school quality vary with respect to statistical significance but the magnitude of the effects are small.

Conclusion

The results highlight some interesting findings; in particular, the decrease in the magnitudes of the racial and ethnic differences in college performance. Based on my estimates, the effects of college quality as measured by my measures of quality are small. These estimates should be considered with some caveats.

The first caveat involves the sampling frame. I selected a sample with the information that I desired but where attrition wasn't a problem. This was the reason that conditioned on the number of terms. However, by conditioning on the number of terms I ignore the possible effects of quality on attrition and select a more talented sample, which explains the shrinkage in the magnitude of both racial and ethnic differences.

The second caveat involves the method of estimation. I estimated a series of models that were cross sectional with respect to Term. The administrative data sets permit a panel structure. Consider models of the following form:

$$SemGPA_{it} \;=\; \sum_{t=1}^{6} D_t \;+\; x'_{it}\beta \;+\; \varepsilon_{it}$$

$SemGPA_{it}$ is student i's grade point average. in term t. D_t are dummy variables that assume a value of one in term t. The x_{it} are the covariates. They include characteristics that student i possessed upon entering either the University of Texas at Austin or Texas A&M. x_{it} includes the student's test scores, decile rank, and ethnicity. The models also include data on the student's high school—for example, the average SAT score of the high school, high school demographics, and the rate at which the graduates of a high school take admissions examinations. In such a framework, perhaps I can deal with the issue of correlation of the ε_i's across the terms. In most instances, I would be tempted to include student fixed effects, but this would be pointless as covariates that describe the students background do not vary within student. Variation must come from between students and within high schools over time. I will implement such an approach in future work.

The final caveat addresses the measures of high school quality. Perhaps the variables aren't a good measure of quality, a characteristic that is essential to the performance production function, but is exceedingly difficult measure. Another possibility is that my quality measures are good proxies for quality but don't vary enough to produce reliable estimates.

References

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Table 1: Average GPA by Term at UT-Austin

Term	Whites	Blacks	Hispanics
First Term	3.17	2.98	3.07
Second Term	3.06	2.85	2.94
Third Term	3.04	2.79	2.87
Fourth Term	3.02	2.68	2.84
Fifth Term	3.05	2.68	2.85
Sixth Term	3.04	2.72	2.84

The table contains the average GPA of White, Black, and Hispanic students who are enrolled a minimum of six semesters at the University of Texas at Austin between the years 1992 and 2002.

Table 2: Average GPA by Term at Texas A&M-College Station

Term	Whites	Blacks	Hispanics
First Term	2.92	2.69	2.74
Second Term	2.93	2.68	2.72
Third Term	2.97	2.64	2.75
Fourth Term	2.99	2.61	2.76
Fifth Term	3.05	2.68	2.78
Sixth Term	3.04	2.63	2.78

The table contains the average GPA of White, Black, and Hispanic students who are enrolled a minimum of six semesters at Texas A&M-College Station between the years 1992 and 2002.

Table 3: Summary Statistics

Variable	UT-Austin	Texas A&M
Test Score	1217	1170
	(141)	(137)
Male	.47	.46
	(.50)	(.50)
Black	.04	.03
	(.19)	(.18)
Hispanic	.10	.08
	(.30)	(.27)
White	.63	.83
	(.48)	(.38)
Asian	.23	.04
	(.42)	(.21)
School Avg. SAT	1032	1041
	(72)	(66)
Percent Taking Adm. Exam	80	74
	(11)	(13)
N	20424	20238

The table contains summary statistics for the set of enrollees from the administrative data sets from both the University of Texas at Austin and Texas A&M-College Station. The sample consists of enrollees who attended at least their respective institution for at least terms and have no missing values for any of the covariates. Standard Deviations are in parentheses. N refers to the number of enrollees, i, not enrollee term, it.

Table 4: Term GPA Regressions: UT-Austin

	First Term		Second Term	
Test Score	.002	.002	.002	.002
	(57.7)	(59.9)	(36.8)	(37.8)
Male	-.18	-.18	-.22	-.22
	(19.3)	(19.3)	(19.9)	(19.8)
Black	-.07	-.05	-.04	-.03
	(2.3)	(2.1)	(2.1)	(2.0)
Hispanic	-.07	-.06	-.03	-.04
	(3.3)	(3.1)	(2.9)	(2.8)
Asian	.03	.03	.04	.03
	(2.4)	(2.1)	(2.9)	(2.7)
High School Avg. SAT		-.0001		-.0003
		(1.1)		(1.2)
Percent Taking Adm. Exam		.002		.001
		(3.1)		(2.0)
R^2	.17	.18	.12	.14
N	20424	20424	20424	20424

The table contains results from regressions of Term GPA on a set of personal and high school level characteristics. All regressions include year effects, indicators for both mother's and father's education, the fraction unemployed in the high school's zip code as of he year 2000, and the fraction of the population with at least a bachelor's degree in the high school's zip code as of the year 2000. . High School Avg. SAT is the average SAT score of the enrollee's high school. Percent Taking Adm. Exam refers to the percentage of the graduates from the enrollee's high school who attempted an admissions examination, either the SAT or ACT. Standard errors are clustered at the high school level. Parentheses contain the value of the t-statistics for the parameter estimates.

Table 5: Term GPA Regressions: Texas A&M-College Station

	First Term		Second Term	
Test Score	.002	.002	.002	.002
	(53.6)	(53.6)	(47.0)	(47.1)
Male	-.15	-.15	-.19	-.19
	(15.1)	(14.7)	(19.8)	(19.7)
Black	-.04	-.03	-.05	-.04
	(.44)	(.13)	(1.6)	(1.4)
Hispanic	-.06	-.05	-.08	-.08
	(3.2)	(2.7)	(4.7)	(4.4)
Asian	.05	.05	.04	.04
	(2.2)	(2.2)	(1.5)	(1.6)
High School Avg. SAT		.00004		-.00004
		(.28)		(.38)
Percent Taking Adm. Exam		.002		.0006
		(3.5)		(1.1)
R^2	.15	.15	.15	.15
N	20238	20238	20238	20238

The table contains results from regressions of Term GPA on a set of personal and high school level characteristics. All regressions include year effects, the fraction unemployed in the high school's zip code as of he year 2000, and the fraction of the population with at least a bachelor's degree in the high school's zip code as of the year 2000. High School Avg. SAT is the average SAT score of the enrollee's high school. Percent Taking Adm. Exam refers to the percentage of the graduates from the enrollee's high school who attempted an admissions examination, either the SAT or ACT. Standard errors are clustered at the high school level. Parentheses contain the absolute value of the t-statistics for the parameter estimates.