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## INEQUALITY, STUDENT ACHIEVEMENT, AND COLLEGE ADMISSIONS: A REMEDY FOR UNDERREPRESENTATION\*

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### ABSTRACT

Large socioeconomic and ethnic disparities exist in college admissions. This paper demonstrates that by systematically accounting for the effect of socioeconomic circumstance on pre-college achievement, colleges can substantially reduce these disparities. A conceptual model distinguishes students' realized achievement from their underlying ability (inclusive of effort and motivation) and relates achievement differences to both ability and socioeconomic circumstance. The model shows that an admissions policy that systematically accounts for the relationship between circumstance and achievement can significantly increase the representation of socioeconomically disadvantaged and minority students. Empirical findings using California data confirm this result: socioeconomic circumstance is strongly related to pre-college achievement, and much of the ethnic disparity in achievement, as measured by SAT I scores and high school grade-point averages, can be attributed to circumstance. The estimated relationship between circumstance and achievement is used to construct alternative measures of achievement that account for the influence of circumstance. Simulation of admissions policies demonstrates that, by relying on such measures, a college can greatly reduce socioeconomic and ethnic underrepresentation among admitted students.

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## I. INTRODUCTION

Consider two applicants to a selective college. The first applicant graduated with a 3.7 grade-point average from a high school that typically sends few students to college; his or her parents are poor, neither of them has a college degree, and they live in a neighborhood with low property values and high unemployment. Suppose the average SAT I score for an applicant from these circumstances is 900, but this applicant scored 1190. The second applicant graduated with a 3.7 grade-point average from a high school where college-going is the norm; his or her parents are wealthy, they both have advanced degrees, and they live in a neighborhood with high property values and low unemployment. Suppose the average SAT I score for an applicant from these circumstances is 1200, but this applicant scored 1290. If the college must choose between these students, should it select the more advantaged student who scored 90 points better than expected? Or should it select the disadvantaged student who, despite scoring 100 points lower, surpassed expectations by 290 points, more than three times the margin achieved by his or her peer? This paper presents a method for deciding – that is, for taking account of socioeconomic inequality and its role in pre-college achievement. Simulations of alternative policies demonstrate that doing so can substantially reduce socioeconomic and ethnic disparities in college admissions.

Socioeconomic disparities in admissions have been well documented. In a national sample of selective colleges and universities, Bowen and Bok (1998) found that white students from disadvantaged socioeconomic backgrounds were represented at less than 10 percent of their proportion in the national population; black students were represented at less than one-third of theirs. Socioeconomically disadvantaged students are also underrepresented, though less so, at the University of California (UC), one of the nation's largest public university systems. In UC's 1998 freshman class, families with income below \$30,000 are represented at only three-quarters of their proportion in the California population, while families with income above \$90,000 are represented at over one-and-a-half times their proportion in the population. These differences have persisted for many years (UCOP, 1999).

Ethnic disparities have long been recognized as well. In 1998, for example, black and Hispanic students were admitted, across all eight undergraduate UC campuses, at about 40 percent of their proportion in the population of high school graduates. At UC Berkeley, the system's most selective campus, these ethnic groups fared even worse: black and Hispanic students were admitted, respectively, at 37 and 27 percent of their proportion among high school graduates.<sup>1</sup> Such ethnic and socioeconomic outcomes reflect differences across groups in measures of academic performance. National data have consistently shown that students from low-income, black, or Hispanic families score substantially lower, on average, on the SAT I examination than do students from high-income, white, and Asian families (e.g., College Board, 2002).

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<sup>1</sup> Author's calculations based on students graduating from California public high schools in 1998. Data come from the California Basic Educational Data System (CBEDS) and the University of California.

To the extent that differences in college admission rates or measures of academic performance result from differences in the quality of primary and secondary education, an obvious solution would be to provide equal and adequate educational opportunities to all students, regardless of socioeconomic circumstance. Colleges and universities, however, do not have the resources to effect this solution; they have at most a limited ability to influence pre-college education through supplemental student outreach and teacher training programs. In the face of pervasive and enduring differences in educational quality, they must select from among students who have had a wide variety of educational experiences.

Colleges have several options for dealing with educational inequality. They can ignore it, choosing to admit students with the best pre-college credentials, irrespective of circumstance. Alternatively, they can give preferential treatment to students from underrepresented ethnic groups. Such “affirmative action” policies have proven controversial and divisive, however, not only because they apply different criteria to different students, but because they do so on the basis of a characteristic that many people perceive, correctly or incorrectly, as irrelevant to students’ educational opportunities. In California, this controversy led the UC Regents to pass Resolution SP-1, which prohibited ethnicity-based affirmative action in UC admissions:<sup>2</sup>

Section 2. Effective January 1, 1997, the University of California shall not use race, religion, sex, color, ethnicity, or national origin as criteria for admission to the University or to any program of study.

SP-1 had a large impact. Between 1995 and 2000, while the UC system experienced a 19 percent increase in the total number of admitted students, the number of admitted black, Hispanic, and Native American students declined by 1 percent. At UC’s most selective campuses, the effect was even larger. While UC Berkeley, for example, admitted 5 percent fewer total students in 2000 than in 1995, it admitted 42 percent fewer minority students. Furthermore, these declines occurred at the same time as Hispanics were the fastest growing ethnic group among California high school graduates.

A third option for addressing inequality is for colleges to directly consider socioeconomic circumstance when making admissions decisions. Under such a policy, a student’s performance would be evaluated relative to his or her educational opportunities. Indeed, in the UC case, SP- 1 contained a mandate for the university to institute this type of policy:

Section 4. ... consideration shall be given to individuals who, despite having suffered disadvantage economically or in terms of their social environment ... have nonetheless demonstrated sufficient character and determination in overcoming obstacles to warrant confidence that the applicant can pursue a course of study to successful completion.

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<sup>2</sup> In order to combat the perception that UC did not welcome minority students, the UC Regents rescinded Resolution SP-1 in 2001. From a policy perspective, however, the rescission was moot because in 1996 a prohibition against affirmative action, Proposition 209, was approved by voters and incorporated into California’s state constitution.

Just as affirmative action reduces ethnic inequality in college admission, a policy that considers circumstance would, by design, reduce socioeconomic inequality. Theoretically, since underrepresented minority groups tend to be relatively disadvantaged socioeconomically, such a policy should also reduce ethnic inequality. The empirical research presented in this paper supports this conjecture: a policy that systematically accounts for the effects of socioeconomic circumstance can substantially increase minority representation as well.

This approach and conclusion differ from those in the existing literature. Kane (1998) argues that, since low-income white students outnumber low-income minority students, particularly among those with the strongest academic credentials, an admissions policy granting preference to low-income students would do little to reduce ethnic underrepresentation. Bowen and Bok (1998) reiterate this claim and supplement it with an analysis based on an admittedly crude measure of socioeconomic status. Neither of these studies, however, consider more comprehensive or refined measures of circumstance, and both presume that colleges would rely on simple policies that reserve places for students who fall below a socioeconomic threshold.

Many colleges and universities already consider socioeconomic factors when making admissions decisions. Typically, they either instruct application readers to evaluate each candidate with respect to his or her circumstance, or they establish scoring systems and award extra points to applicants who have faced socioeconomic or educational disadvantage. They do not, however, typically base their consideration of circumstance on any measure of its effect on student achievement.

A more sophisticated policy – the one examined in this paper – would be to control statistically for the effect of circumstance on pre-college achievement. Carnevale and Haggighat (1998) explore a version of this approach and find that it would not significantly affect ethnic representation. There are, however, some limitations to their study. First of all, the authors use only a simple indicator to identify students, labeled “strivers”, who outperformed circumstance-based predictions of their SAT I scores by 100 or more points. More importantly, the authors restrict consideration to students who score between 1000 and 1200 on the SAT I. This precludes, for example, comparing a disadvantaged student scoring 1190 to a more privileged student scoring 1290. Furthermore, within any score range, white and Asian students score higher, on average, than black and Hispanic students. Therefore, although the strivers pool had ethnic proportions similar to the pool of all students in the 1000-1200 band, the standard admissions procedure – selecting students above a cutoff score within this band – would have produced a less representative ethnic distribution. It is also possible that the authors would have found a higher proportion of black and Hispanic strivers among students at higher score ranges. In a more recent and comprehensive report (although one that does not pursue this statistical methodology), Carnevale again concludes that socioeconomic preferences are not an effective substitute for affirmative action (Carnevale and Rose, forthcoming).

The research in this paper suggests otherwise. Section II presents a conceptual model that explains how controlling for the effects of socioeconomic circumstance can yield a highly capable and ethnically and socioeconomically representative pool

of admitted students. In Section III, California data that include a rich set of socioeconomic indicators are used to estimate empirically the effect of circumstance on pre-college achievement. The results demonstrate that much of the ethnic disparity in achievement can be attributed to circumstance. In Section IV, the empirical estimates are used to construct measures of achievement that account for circumstance. These measures are then used to simulate UC admissions under a policy that considers achievement in the context of circumstance. Compared to actual UC admissions or to simulations of policies that rely on traditional measures of achievement, the policy that accounts for circumstance is substantially more socioeconomically and ethnically representative of the population of California high school graduates. Section V presents a discussion and conclusions.

## II. CONCEPTUAL FRAMEWORK

Before examining data, it is useful to establish a conceptual framework for discussing economic and social circumstance, student achievement, and college admissions policy.<sup>3</sup> For simplicity, we divide a student's development into three time periods: (i) the pre-college years, (ii) the point of application to college (roughly age 18), and (iii) the point of graduation from college. We denote these as time 0, time 1, and time 2, respectively.

### Student Ability, Achievement, and Circumstance

In general, a student's realized academic achievement at the point of application to college (denoted  $a_1$ ) is influenced by two sets of factors from the pre-college years. The first set, referred to as the student's underlying ability ( $a_0$ ), is broadly construed to include all factors – such as native intelligence, effort, and motivation – that the student brings to the determination of pre-college achievement. The second set, referred to as the student's circumstance ( $c_0$ ), constitutes the student's economic and social environment during the pre-college years and includes such factors as family income, parents' education, school quality, and neighborhood characteristics (average education, average income, employment rate, etc.). Circumstance, as conceived here, does not include ethnicity, which is assumed to be unrelated to student achievement. Better circumstance leads to higher pre-college achievement, as does higher ability.

Distinct from a student's realized achievement is his or her *potential* achievement at the time of application to college ( $A_1$ ) – the hypothetical maximum achievement, for a student with given ability, under optimal pre-college circumstances. For a student with such circumstances (well-educated parents, high quality schooling, etc.), realized and potential achievement will be equal; for a student with poor circumstances, realized achievement will be lower than potential achievement. Potential achievement is directly related to underlying ability: the higher a student's ability, the higher his or her potential achievement. Potential achievement is related only to ability; it is independent of circumstance.

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<sup>3</sup> A forthcoming paper (Studley, in progress) will present a formal model that builds upon this conceptual framework, and in which student behavior, college admissions policy, and their implications are derived from objectives and constraints.

It is worth emphasizing that, throughout this exposition, the word “ability” refers not only to native intelligence, but also to motivation and effort; it is meant to convey characteristics that might be considered internal to the student. In contrast, the word “circumstance” is used to denote characteristics external to the student: his or her opportunities or socioeconomic environment. Realized achievement, therefore, is the product of a student’s intelligence, drive, and opportunities. Potential achievement depends on intelligence and drive but abstracts away from opportunities. A lazy student might have the same native intelligence as a hardworking peer, but, as defined here, he or she will have lower underlying ability and lower potential achievement.

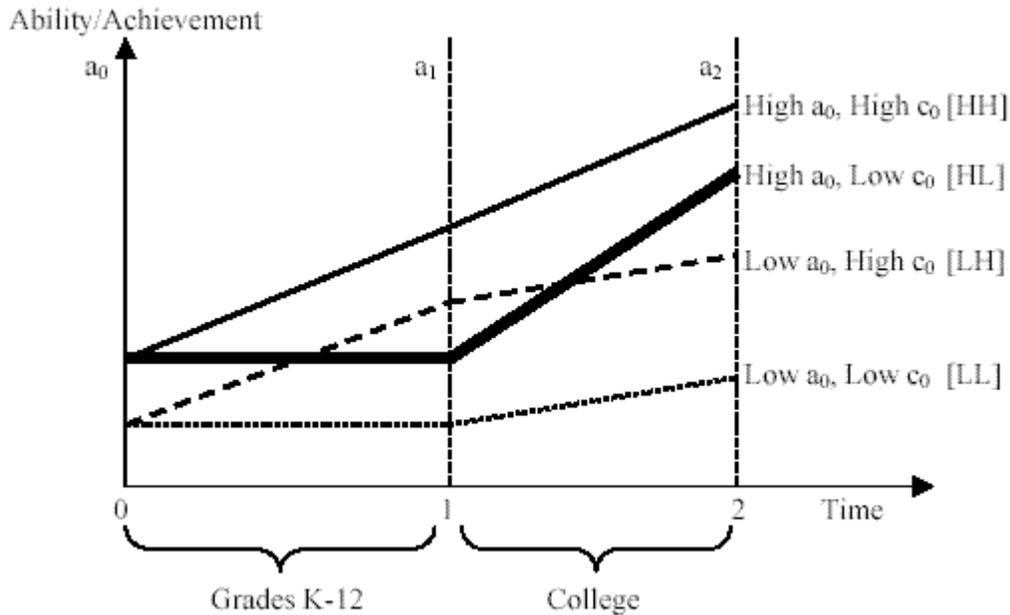
The ultimate level of student achievement at the point of college graduation ( $a_2$ ) is determined by the combination of realized pre-college achievement and underlying ability. Consider, for example, two students with identical realized achievement, one of whom has higher ability but poorer circumstance than the other. The higher ability student might be expected to have higher achievement upon college graduation. He or she might also be expected to have higher achievement upon graduation than a third student with similar ability but lower pre-college achievement. Thus, both realized achievement and underlying ability influence ultimate achievement. Since potential achievement is related only to ability, we can also conceive of ultimate achievement as determined by both realized and potential pre-college achievement. The progression of student achievement is summarized in Table 1.

**Table 1: Conceptual Framework for Student Achievement**

	Concept	Notation	Determined By
<b>Time 0</b>	Underlying ability (includes effort)	$a_0$	--
	Social and economic circumstance	$c_0$	--
<b>Time 1</b>	Realized pre-college achievement	$a_1$	$a_0, c_0$
	Potential pre-college achievement	$A_1$	$a_0$
<b>Time 2</b>	Ultimate achievement (upon college graduation)	$a_2$	$a_1, a_0$ (or $a_1, A_1$ )

An important question is whether socioeconomically disadvantaged students can narrow the achievement disparity between themselves and students with identical ability but better circumstance. That is, if a student’s realized achievement is significantly lower than his or her potential achievement, can the student catch up to a more advantaged peer? Indeed, can he or she even keep up, or might an achievement gap grow wider during college? This issue is illustrated in Figure 1, in which the trajectories represent students with different levels of ability ( $a_0$ ) and circumstance ( $c_0$ ). The solid trajectories represent two high-ability students and depict the case in which the disadvantaged student (labeled “HL” in the figure) narrows the achievement gap during college: the  $a_2$  gap between these two students is smaller than their  $a_1$  gap. The dashed trajectories represent two low-ability students and depict the case in which the achievement gap remains constant through college.

**Figure 1: Student Achievement Trajectories**



**College Admissions Policies**

Selective colleges cannot admit all applicants. A college’s objectives, together with the available information, determine the policy that it uses to choose students. Available information typically includes realized pre-college achievement as measured by admission test scores<sup>4</sup> and high school grades. A college rarely, if ever, has direct information on students’ underlying ability or potential pre-college achievement, but it may have information on student circumstance that it can use, in combination with realized achievement, to estimate these characteristics – that is, to evaluate realized achievement in the context in which it occurred. Potential admissions policies, and the objectives that might generate them, include:

1. **Choose students with the highest level of realized achievement ( $a_1$ ).** In practice, a college would implement this policy by admitting students based only on high school grades and test scores (and possibly additional, less easily quantifiable, indicators of achievement). College officials would use this criterion if (i) they believe students with the highest realized achievement are the most deserving of admission, (ii) they desire the best possible realized achievement profile for their admitted class, or (iii) they wish to select students according to underlying ability but do not have sufficient information to determine it. For the cases depicted in Figure 1, this

<sup>4</sup> While popular perception holds that the SAT I: Reasoning Test – the most commonly used admissions test in the U.S. – is a test of a student’s aptitude or native intelligence, most testing experts, as well as the College Board itself (which owns the test), consider the SAT I to be a test of developed abilities, i.e. realized achievement. The main distinction between it and the SAT II: Subject Tests is not that the SAT I tests aptitude while the SAT II tests achievement, but rather that the SAT I is less directly linked to a college preparatory curriculum. Both tests confound circumstance with underlying ability.

policy might admit the students labeled “HH” and “LH”, even though the latter has lower ability and predicted ultimate achievement than student “HL”.

2. **Choose students with the highest level of realized achievement (a1) within each ethnic group, and impose a desired ethnic distribution across groups.** This is ethnicity-based affirmative action, and it requires a different minimum achievement level for each ethnic group. College officials would choose this policy if (i) they care about both realized achievement and proportional representation across ethnic groups or (ii) they care about underlying ability, or achievement in the context of circumstance, and rely on ethnicity as a proxy for circumstance.
3. **Choose students with the highest level of underlying ability (a0) or potential achievement (A1).** Under this policy, a college selects those students who *would have had* the highest level of pre-college achievement given adequate resources, and it determines this by considering realized achievement within the context in which this achievement occurred. College officials would follow this policy if (i) they believe students with the highest underlying ability (inclusive of motivation and effort) are the most deserving of admission or (ii) they wish to “level the playing field” – that is, to require higher achievement from students who had better circumstances. For the cases depicted in Figure 1, this policy would admit the high-ability students “HH” and “HL”, even though the latter has lower realized pre-college achievement than student “LH”. As depicted, the admitted students would also have the highest ultimate achievement, but this depends on the disadvantaged high-ability student being able to outperform the more advantaged but lower ability student during college.
4. **Choose students who will attain the highest level of achievement upon college graduation (a2).** This policy is based on predicted student outcomes, where predictions are based on realized pre-college achievement and circumstance. College officials might choose this policy if (i) they believe students expected to have the highest final achievement are the most deserving of admission or (ii) they desire the best possible profile of student achievement upon graduation.

### Policy Implications

A college’s admissions policy affects the distribution of characteristics – such as ability, circumstance, and ethnicity – in its pool of admitted students. In order to examine how these characteristics would be distributed under the various policy alternatives, we make the following assumptions:

- A. Students from minority ethnic groups are more likely to come from disadvantaged circumstances (i.e., to have low  $c0$ ) than are non-minority students.
- B. Underlying ability ( $a0$ ) is distributed equally across minority and non-minority groups.
- C. Underlying ability ( $a0$ ) and circumstance ( $c0$ ) are not correlated.

Under policy 1, since circumstance has a direct impact on realized pre-college achievement, students from disadvantaged backgrounds are less likely to be admitted to college than their more advantaged peers.<sup>5</sup> Consequently, since minority groups tend to have poorer circumstances, they will be underrepresented in the pool of admitted students relative to their proportion in the college-age population. Minority underrepresentation would be remedied by policy 2, although, within ethnic groups, disadvantaged students would still be less likely to be admitted to college. Under both of these policies, some students denied admission would have higher underlying ability than others who would be admitted.

To the extent it can be implemented – that is, to the extent a student’s underlying ability or potential pre-college achievement can be determined – policy 3 would select not those students with the highest absolute level of realized achievement, but rather those who have the highest realized achievement within their particular economic and social context. Under this policy, since we assume ability is equally distributed across population groups, minority students would be proportionately represented in the pool of admitted students. Similarly, since the admissions criterion under policy 3 is independent of circumstance, disadvantaged students would also be proportionately represented.<sup>6</sup> Furthermore, although some denied students would have higher realized achievement than some admitted students, all population groups are treated equally, and all admitted students would have higher underlying ability than those denied admission.

To analyze policy 4, which admits students on the basis of predicted future achievement, it is useful to consider two extreme cases. First of all, suppose college attendance allows students to remedy fully a gap in achievement – that is, to “catch up” with their more advantaged but similar ability peers. In this case, policy 4 would effectively admit students according to their underlying ability and would, therefore, have the same outcomes as policy 3. Secondly, suppose gaps in achievement are persistent and cannot be narrowed by college attendance. In this case policy 4 would effectively admit students according to realized pre-college achievement and would yield the same outcomes as policy 1. If reality lies somewhere between these two cases, or if the amount that an achievement gap can be overcome differs across students, then the outcomes of policy 4 would lie somewhere between those of policies 1 and 3.

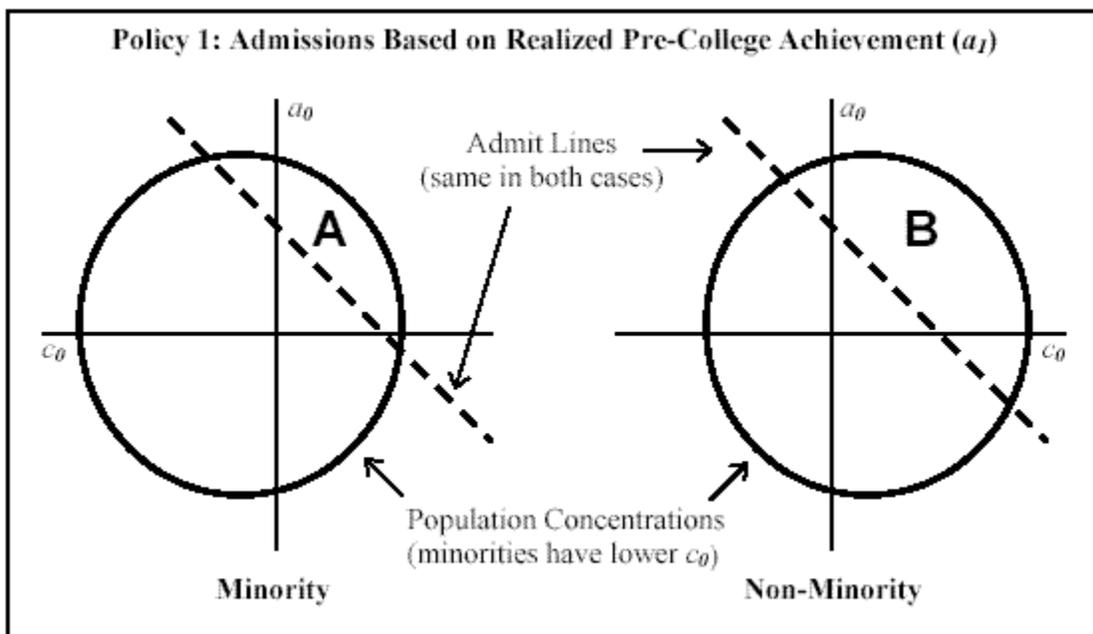
These results can be illustrated graphically. Figures 2A through 2C depict the assumed distributions of underlying ability ( $a_0$ ) and circumstance ( $c_0$ ) across the minority and non-minority populations. A student’s  $a_0$  and  $c_0$  determine his or her

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<sup>5</sup> A second, indirect reason for this outcome may be a disincentive to effort under policy 1. If disadvantaged students believe that their circumstance makes admission to college unlikely, they may be less inclined to work hard in school, thereby further lowering their realized pre-college achievement. The effect of admissions policies on student effort will be explored in a forthcoming paper (Studley, in progress).

<sup>6</sup> The proportional representation of disadvantaged students relies, in part, on the assumption that underlying ability and circumstance are not correlated. If instead these factors are positively correlated – as might be the case if high-ability parents tend both to produce children of high ability and to provide them with better circumstances – then policy 3 would produce an admitted class in which disadvantaged students were underrepresented relative to their proportion in the college-age population but still less so than they would be under policies 1 and 2.

placement in the relevant the graph. (For example, a student in the northwest quadrant of a graph would have high underlying ability and disadvantaged circumstances.) The circles on the graphs indicate the overall tendencies within each population group and reflect the assumed relationships among group, underlying ability, and circumstance. Specifically, the identical vertical position of the two circles in each pair of graphs reflects the assumption of an equal underlying distribution of ability across groups, and the leftward shift of the circle in the minority graphs reflects the assumption that this group is relatively worse off economically. Although the minority and non-minority groups may differ in size, the circles represent equal proportions of each group relative to its total population. While individual students may possess a combination of ability and circumstance that places them outside the circle on their group’s graph, the circles nonetheless indicate the overall concentration of attributes within each population group.<sup>7</sup>



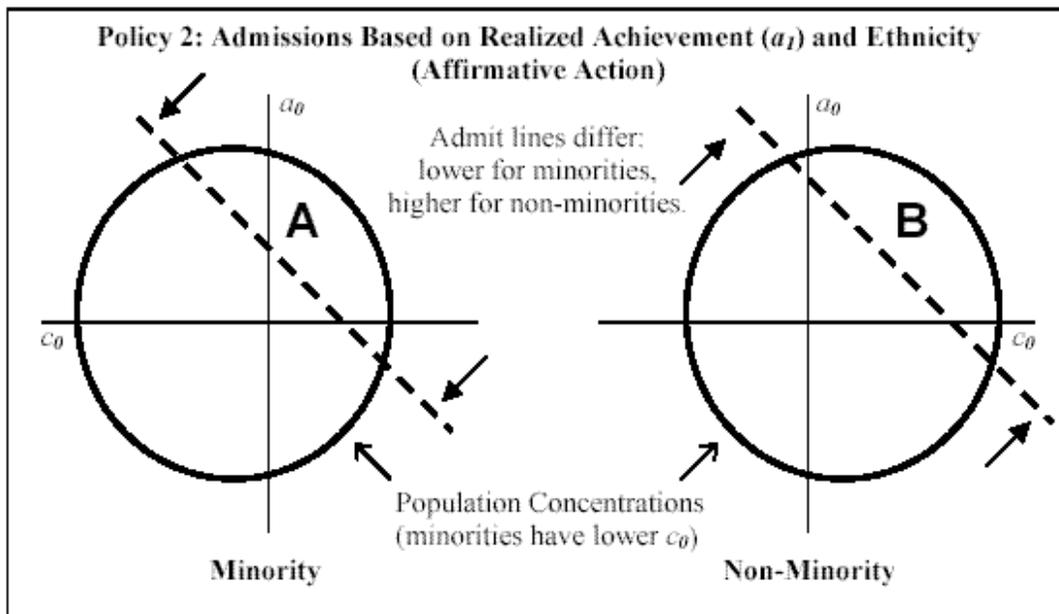
**FIGURE 2A.** A student’s underlying ability ( $a_0$ ) and circumstance ( $c_0$ ) determine his or her position on the relevant graph. Circles indicate population concentrations and reflect the assumptions that (i)  $a_0$  is equally distributed across minority and non-minority groups and (ii) minority students, on average, have lower  $c_0$ . Pre-college achievement ( $a_1$ ) is affected positively by  $a_0$  and  $c_0$ . Under policy 1, all points on either admit line have the same  $a_1$ , and students on or above the lines are admitted to college. This yields underrepresentation of minority students (area A is smaller than area B) and disadvantaged students (areas A and B lie toward the right-hand side of each graph).

Figures 2A through 2C also depict the sets of students that would be admitted to college under each of the policy alternatives. The dashed lines in each graph reflect admissions rules consistent with the policy under consideration. Under policy 1 (admit students with highest  $a_1$ ), these “admit lines” are identically positioned for the

<sup>7</sup> Mathematically, the circles represent level curves of the joint probability distribution of  $a_0$  and  $c_0$ . If these variables were positively correlated, the level curves would instead be ellipses with upward sloping major axes. With one exception, described in the previous footnote, policy outcomes would remain unchanged.

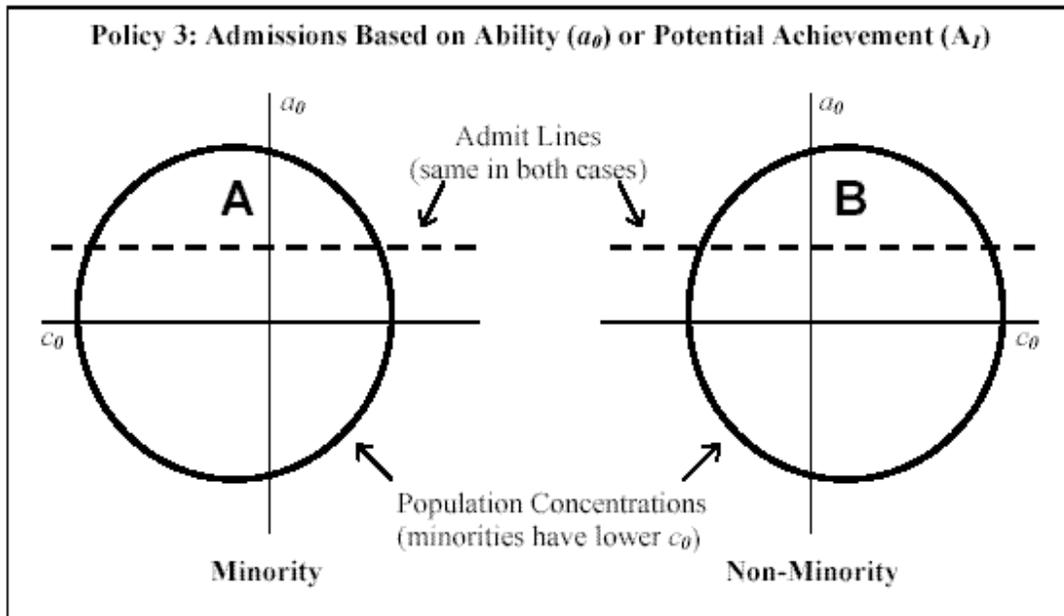
minority and non-minority groups, and all points on the two lines indicate combinations of ability and circumstance that produce the same level of realized pre-college achievement. Points on or above these lines represent the high-achieving students who would be admitted to college. Since the lines are negatively sloped, some admitted students would have lower underlying ability than some students denied admission. Furthermore, under policy 1, admitted students tend to be relatively advantaged (areas A and B lie toward the right-hand side of each circle) and have high ability (areas A and B lie toward the top of each circle), and a smaller proportion of the minority group than the nonminority group would be admitted to college (area A is smaller than area B).

Policy 2 (affirmative action) produces equal representation across population groups (area A equals area B). It relies, however, on a different admissions rule for each group to achieve this outcome: the minority admit line shifts downward relative to the non-minority admit line and represents a lower level of realized pre-college achievement. Under this affirmative-action-style policy, as under policy 1, admitted students tend to be relatively advantaged and to have high ability.



**FIGURE 2B.** Under policy 2, the minority admit line shifts downward and represents a lower level of  $a_1$  (which is constant along each line) than does the non-minority line (which shifts upward). More minority students and fewer non-minority students lie above their respective admit lines, and thus are admitted to college, than under policy 1. This policy yields proportionate representation of minority and non-minority students (area A is equals area B) while disadvantaged students remain underrepresented.

In contrast to these policies, policy 3 (admit students with highest  $a_0$  or  $A_1$ ) relies on identical admissions rules for each group *and* yields proportional representation of each group (again, area A equals area B). Since the admit lines are horizontal, all admitted students have higher ability than all denied students, and admitted students have higher average ability than under the other policies. Socioeconomically, admitted students tend to be less advantaged than under the other policies (areas A and B sit farther to the left in the graphs of policy 3 than in the other pairs of graphs) and are representative of the underlying population.



**FIGURE 2C.** Pre-college achievement ( $a_1$ ) differs along the two admit lines. These lines, however, are identical for minority and non-minority students. All points on either admit line have the same  $a_0$  or  $A_1$ , and students on or above the lines are admitted to college. Minority students are proportionately represented (area A equals area B), as are disadvantaged students (areas A and B are horizontally centered). Overall, admitted students have higher  $a_0$ , lower  $c_0$ , and lower  $a_1$  than under policies 1 and 2.

Policy 4 is not graphed separately, but if disadvantaged students who attend college can remedy an achievement gap between themselves and their more advantaged peers, then the graphs and outcomes of policies 3 and 4 would be identical. Conversely, if the achievement gap persists through college, then the graphs and outcomes of policies 1 and 4 would be identical. If instead reality lies between these extremes, then the graphs of policy 4 would have admit lines that are negatively sloped but flatter than those of policy 1. In this case, minority and disadvantaged students would be underrepresented, although less so than under policy 1. Average underlying ability would be greater than under policy 1 but less than under policy 3.

This conceptual framework raises several empirical questions. First of all, given measures of realized pre-college achievement and circumstance, how can we construct measures of underlying ability (or potential pre-college achievement)? That is, how can we take account of the circumstance in which achievement occurred? Secondly, does the evidence suggest that an admissions policy that relies on these measures would yield the outcomes indicated by the conceptual analysis? Subsequent sections of this paper address these issues in turn. Another set of questions centers on achievement after admission to college: how well can it be predicted, can an achievement gap be remedied, what would the distribution of future achievement look like for students admitted under different policies, and what do the data suggest would be the characteristics of the pool of students admitted according to predictions of their future achievement? These topics will be pursued in future work.<sup>8</sup>

<sup>8</sup> Predicted college achievement, however, might not be particularly useful as a criterion for

### III. THE EFFECT OF CIRCUMSTANCE ON ACHIEVEMENT

In this section, we focus on the question: what is the empirical relationship between a student's pre-college achievement and the circumstances or context in which this achievement was realized? With an estimate of this relationship, we will be able to isolate the part of measured achievement that is not correlated with circumstance and use it as an indicator of underlying ability. As mentioned earlier, the notion of ability used here is broadly construed to include such factors as native intelligence, effort, and motivation – that is, any factor other than socioeconomic circumstance, whether chosen or predetermined, that the student brings to the determination of pre-college achievement.

#### Data and Methodology

To measure pre-college achievement we use two standard academic indicators: (i) the sum of SAT I Verbal and Math examination scores [SAT] and (ii) high school grade-point average [GPA]. To measure circumstance, we use a comprehensive set of indicators that consists of family characteristics, neighborhood of residence (defined by zip code), and high school attended. The available variables for family characteristics are income, both parents' educational attainment, and whether English is the student's first language. These data come from the College Board and constitute the 1998 cohort of college-bound seniors from California public high schools for whom we have complete data on SAT, GPA, and demographic variables. (GPA and demographic data are self-reported.) Some descriptive statistics on these 86,514 students are presented in the first column, and footnote, of Table 3 (in the next section).

Circumstance is a predictor of pre-college achievement, and we can estimate this relationship using statistical regression techniques. (The regression results are discussed below.) Then, by "plugging in" a specific set of circumstances, the regression model yields an estimate of the expected achievement of a student facing those circumstances. By applying the model to the circumstances faced by each student, we can predict achievement for each student, where the predictions are based solely on circumstance.

Such predictions will explain only part of the variation in measured achievement across students – the part that correlates with circumstance. The remaining variation can be used to measure underlying ability (inclusive of motivation and effort). A student who outperforms a circumstance-based prediction can be considered a relatively high-ability student; one who underperforms can be considered a relatively low-ability student. Therefore, for measures of underlying

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admissions decisions. Such predictions tend to be imprecise, and they are complicated by sample selection issues: it is difficult to predict performance at a particular college for groups of students not typically admitted to that college. Furthermore, long-term predictions (such as achievement upon graduation) may be more relevant than short-term ones (such as freshman year achievement), but the former tend to be even less accurate. Finally, if the goal of admissions policy is to provide educational opportunities to the most motivated and capable students, a measure of underlying ability (as defined herein) or achievement in context would be a more appropriate admissions criterion.

ability or potential achievement, we can use the differences between realized achievement and circumstance-based predictions of achievement:

$$\begin{aligned} [\text{SAT Residual}] &= [\text{Actual SAT}] - [\text{Predicted SAT (based on circumstance)}] \\ [\text{GPA Residual}] &= [\text{Actual GPA}] - [\text{Predicted GPA (based on circumstance)}] \end{aligned}$$

These statistics, which will be used later to simulate admissions under policy 3, can be interpreted as measuring “achievement in context” – that is, achievement relative to what would be expected for a typical student facing the same circumstance.<sup>9</sup>

## Results

Table 2 presents two sets of regression models, the first of which predicts SAT and the second of which predicts GPA. In order to account for variation in grading standards across schools, all the GPA models include indicators (i.e., “dummy variables”) for high school attended. In addition to estimating the relationship between socioeconomic circumstance and achievement, we are interested in the degree to which circumstance accounts for observed differences in achievement across ethnic groups. As a benchmark, therefore, the first model from each set in Table 2 predicts achievement based on ethnicity alone; the estimated parameters are average differences in mean SAT (on a scale of 400 – 1600) or mean GPA (on a scale of 0.0 to 4.3) between the indicated ethnic group and white students. Hispanic students, for example, score 181 points lower on the SAT I than white students, on average, when not controlling for other factors. Model II, for both the SAT and GPA cases, adds family characteristics, such as family income and parents’ education. Model III adds neighborhood indicators, as well as school indicators in the SAT case. Model IV removes ethnicity from consideration and thus predicts achievement based on family, neighborhood, and school circumstance alone. In all models, family income has thirteen categories ranging from “below \$10,000” (the reference category) to “above \$100,000”. Parents’ education has ten categories for each parent, ranging from “missing” (presumed absent) to “completed graduate or professional school”. (The reference category is “grade school for both parents”.) Observations with both parents missing have been discarded. Only a few of the individual parameter estimates for the income and education variables are presented.

Perhaps the most striking result from Table 2 is the degree to which SAT variation across ethnicity is reduced upon accounting for family, neighborhood, and school circumstance. As variables are added to the model, the estimated deficit for black students drops 45 percent, from 217 to 118 points, a decline of nearly half the standard deviation in SAT scores (213 points) in the sample population. The estimated Hispanic deficit decreases even more, from 181 to 46 points, or 75 percent. For Asian students, when circumstance is taken into account an apparent

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<sup>9</sup> It is not being claimed that the SAT and GPA residuals are perfect measures of underlying ability or achievement in context. As with actual SAT and GPA, some of the variation in the residuals is due to random error, and any systematic bias in actual SAT and GPA would occur in the residuals as well. The distinction between the actual and residual measures is simply that the latter remove the effect of circumstance. This parallels the conceptual model, where realized achievement depends on circumstance but underlying ability and potential achievement do not.

**Table 2: Regression Models for the Prediction of Pre-College Achievement**

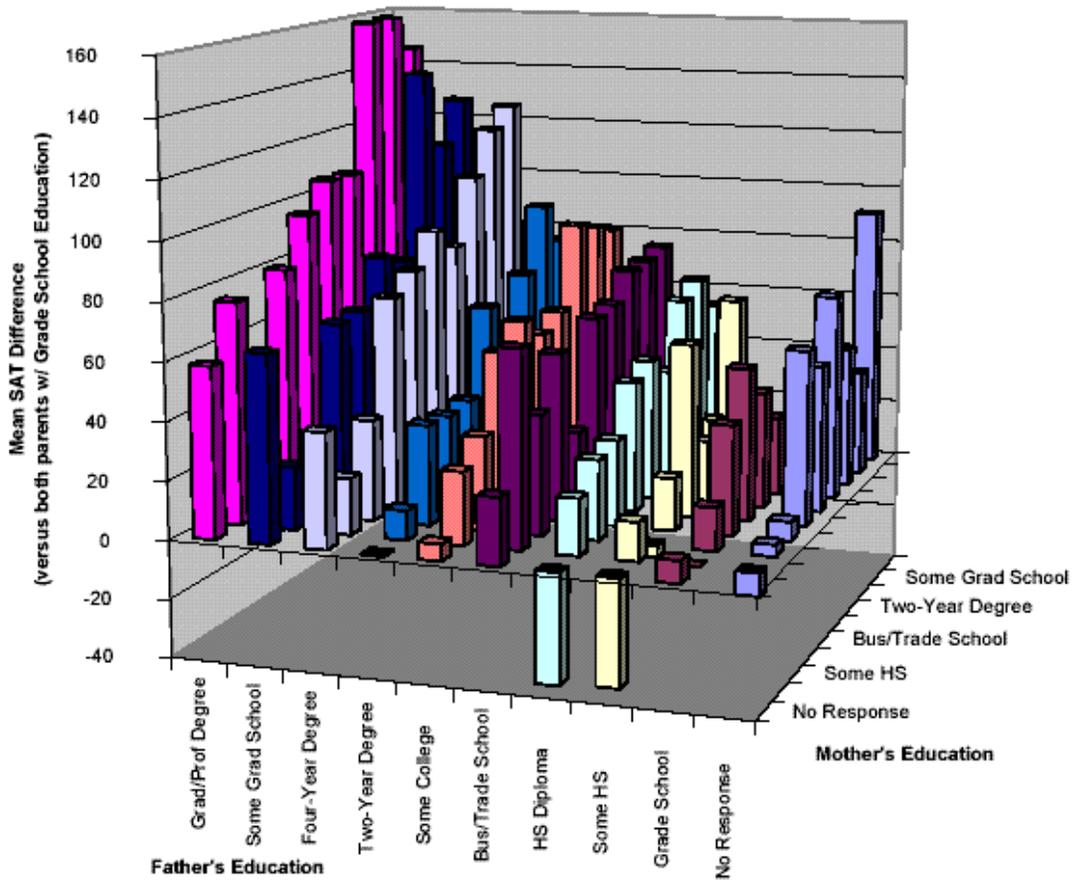
Dependent Variable	SAT I: Verbal + Math					High School GPA			
	Ethnicity Only	Model I Plus Family Characteristics	Model II Plus Indicators for Neighborhood and School	Model III With Ethnicity Omitted	Ethnicity (Includes School Indicators)	Model I Plus Family Characteristics	Model II Plus Indicators for Neighborhood	Model III With Ethnicity Omitted	Model IV
<b>Explained Variance (<math>R^2</math>)</b>	0.142	0.269	0.343	0.322	0.095	0.120	0.135	0.113	
<b>Parameter Estimates</b>									
Intercept	1073	855	908	894	3.49	3.31	3.59	3.54	
Family Income (v. <\$10K) (13 categories, 4 shown)	--	46	38	35	--	0.02	0.02	0.01	
\$15,000 - \$20,000	--	70	52	51	--	0.03	0.02	0.02	
\$30,000 - \$35,000	--	87	65	69	--	0.05	0.04	0.05	
\$60,000 - \$70,000	--	129	87	92	--	0.07	0.06	0.08	
\$100,000 and Above	--				--				
Parents' Educ. (v. Grade Sch.) (99 combinations, 3 shown)	--	55	29	37	--	0.04	0.03	0.06	
High School Grad. (Both)	--	153	104	122	--	0.22	0.21	0.27	
Bachelor's Degree (Both)	--	206	146	160	--	0.31	0.29	0.34	
Graduate Degree (Both)	--				--				
First Language (v. English)	--	-9	-14	160	--	0.04	0.04	0.08	
English and Another	--	-8	-15	-1**	--	0.14	0.14	0.19	
Another	--			4*	--				
Ethnicity (v. White)									
Asian	-35	21	22	--	0.10	0.07	0.08	--	
Black	-217	-155	-118	--	-0.41	-0.36	-0.35	--	
Hispanic	-181	-73	-46	--	-0.19	-0.15	-0.15	--	
Other	-40	-13	-9	--	-0.03	-0.04	-0.04	--	

All models are based on 86,514 college-bound high school seniors from California public schools, 1998. SAT I Verbal plus Math score is on a 400-1600 scale. GPA is on a 0.0 to 4.3 scale. "Asian" includes Filipino and Pacific Islander. F-tests indicate significance of school and neighborhood indicators (not reported in the table) at the 1% confidence level. All parameter estimates are significant at the 1% confidence level except. \*significant at 5%; \*\*not significant at 5%.

SAT score deficit is revealed to be an advantage (i.e., Asian students score higher than white students who have similar circumstances), although the absolute magnitude of the change is much smaller than it is for blacks or Hispanics. These results suggest that a college might remedy ethnic underrepresentation by taking account of the relationship between circumstance and pre-college achievement.

In general, SAT scores are related to circumstance. As measured by the squared multiple correlation ( $R^2$  statistic), the model with ethnicity and family characteristics captures 27 percent of test score variation, and the fully specified model containing neighborhood and school indicators captures 34 percent. Removing ethnicity from the model reduces its fit by only 2 percentage points. Both income and parents' education correlate positively with SAT: students from families with incomes above \$100,000, for example, are expected to score 49 points higher than those from families with incomes between \$15,000 and \$20,000 (model III). Similarly, a positive relationship between parents' education and SAT scores is clearly evident from Table 2 or Figure 3, the latter of which graphically displays the full set of coefficient estimates for parents' education. Furthermore, not having English as a first language has a slightly negative relationship to SAT. Overall, there is strong evidence of the impact of circumstance on SAT.

**Figure 3: Education Coefficients – SAT Regression (Model III)**



The estimated relationship between GPA and circumstance is qualitatively similar to, though weaker than, the relationship between SAT and circumstance. Across all models, income, while positively correlated with GPA, never accounts for more than 0.08 grade points of variation. For comparison, the standard deviation of GPA in the sample is 0.63 grade points. Parents' education, however, is more strongly related to GPA. On average, students whose parents both have bachelor's degrees have GPAs 0.21 points (one third of a standard deviation) higher than do those whose parents have only a grade school education (model III); if both parents have graduate degrees, the advantage rises to 0.29 points. Finally, and unexpectedly, having a first language other than English correlates strongly and positively with GPA, perhaps indicating greater than average ambition among the children of immigrants.

The amount of ethnic disparity accounted for by circumstance also appears smaller for the GPA models than for the SAT models. Adding family and neighborhood variables to the model reduces the estimated average GPA deficit for blacks and Hispanics by only 17 and 23 percent, respectively, as compared with 45 and 75 percent for the SAT models. This is not because the GPA models are less useful in explaining the disparity; rather, it is because there is less disparity to explain. (In part, this is because, unlike the "ethnicity only" SAT model, the benchmark GPA model already includes school indicators to control for differences in grading standards across schools.) In terms of standard deviations, when not controlling for circumstance, the ethnic differences in SAT scores are much larger than those for GPA: the Hispanic SAT deficit, for example, is 0.85 standard deviations (181/213), while the Hispanic GPA deficit is 0.30 standard deviations (0.19/0.63). Adding circumstance variables to the models reduces these deficits to 0.22 and 0.23 standard deviations, respectively.

#### IV. SIMULATION OF ALTERNATIVE ADMISSIONS POLICIES

##### Methodology

For the purpose of simulating admissions policies, the two measures of each student's realized pre-college academic achievement can be combined into a single achievement index that gives them roughly equal weight:

$$[\text{Achievement Index}] = 2.5 \times [\text{SAT}] + 1000 \times [\text{GPA}]$$

Colleges routinely calculate this type of statistic for use in admissions decisions. In a similar spirit, we can create an index of underlying ability, or achievement in context, by combining the two measures constructed from circumstance-based predictions of achievement:<sup>10</sup>

$$[\text{Ability Index}] = 2.5 \times [\text{SAT Residual}] + 1000 \times [\text{GPA Residual}]$$

<sup>10</sup> The presented formula has been simplified for exposition. In practice, in order to keep the same balance between SAT and GPA in the achievement and ability indices, the overall SAT and GPA means are added to the respective residuals before the ability index is constructed.

The residuals used in the ability index<sup>11</sup> are calculated from the model IV equations, which use the full set of circumstance variables, but exclude ethnicity, to construct predictions of SAT and GPA. The achievement and ability indices are used to simulate admissions under alternative policies, as follows:

- **Policy 1 – Admissions Based on Pre-College Achievement:** Of the population of 86,514 seniors from California public high schools in 1998 for whom we had complete data, this policy admits the 33,566 who rank highest according to their achievement index. (33,566 is the number of students from this population who were actually admitted to a University of California campus.)
- **Policy 2 – Affirmative Action:** This policy admits the students who rank highest, within their own ethnic group, according to their achievement index, and it maintains proportional representation across ethnic groups. Twenty-one percent of the 86,514 high school students, for example, are Hispanic: this policy admits the 7,039 (twenty-one percent of 33,566) Hispanic students who rank highest according to their achievement index.
- **Policy 3 – Admissions Based on Ability, Potential Achievement, or Achievement in the Context of Circumstance:** This policy admits the 33,566 students who rank highest according to their ability index.

Policy 4, admissions based on predictions of achievement during college, is not simulated in this paper and will be the topic of future work.

To interpret the following simulation results, a brief explanation of University of California admissions is required. The UC system has eight undergraduate campuses. In order to attend *any* campus, a student must meet a set of minimum eligibility requirements regarding course pattern, GPA, and admissions test scores. All eligible students are guaranteed admission to a UC campus, although not necessarily to the campus of their choice. Individual campuses select their students, using a broad range of criteria, from the pool of eligible applicants. Prior to 1998, when the consideration of ethnicity in UC admissions was abolished, UC implemented affirmative action in two ways: campuses could consider ethnicity when selecting from among eligible applicants, and each campus was allowed to “admit by exception” up to four percent of its class from underrepresented minority students who did not meet the eligibility requirements.<sup>12</sup>

The simulations of UC admissions described above, therefore, are more analogous to systemwide eligibility than to campus selection: the students who were admitted to any UC campus are, in general, those who met the systemwide eligibility requirements.<sup>13</sup> UC’s specific eligibility rules are not incorporated into the simulation

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<sup>11</sup> The SAT and GPA residuals were defined in section III, page 12.

<sup>12</sup> UC’s implementation of affirmative action thus differed from the affirmative action policy simulated in this paper. The former had constraints on the number of applicants for whom ethnicity could be considered and did not require specific ethnic proportions in the pool of admitted students.

<sup>13</sup> The group of admitted students may contain some who were “admitted by exception” (for reasons other than ethnic diversity) and thus technically ineligible for UC, although in 1998 this constituted only one percent of all admitted students. The group of admitted students

of alternate policies, however, since the available data do not include sufficient information on course patterns and grades. Nonetheless, the outcome of the actual UC admissions process serves as a natural benchmark for evaluating simulation results. Results from a second set of simulations, in which a hypothetical campus selects, under each of the alternative policies, one-quarter of the pool of students admitted to any UC campus, are also presented. This second set of simulations is analogous to the process of individual campus selection from among the pool of eligible students. All simulations are simplifications of the actual UC admission process, which incorporates more factors, and human judgment, into admissions decisions.

### **Results: “Eligibility” Simulations**

Table 3 contrasts income and ethnic characteristics and achievement measures for the 1998 population of 86,514 college-bound high school seniors, the 33,566 of these students admitted to UC that year, and the pools of 33,566 students that would be admitted under each of the three simulations. Regarding family income, policy 3 – which admits students based on a measure of their underlying ability (or achievement in the context of circumstance) – produces an income distribution nearly identical to that in the population of high school seniors and much closer to it than does actual admissions or the other simulated policies. Compared to actual 1998 admissions, for example, policy 3 admits twenty percent more students from families with annual incomes below \$25,000 and twenty-three percent fewer from families with incomes above \$70,000. Mean family income under policy 3 is similar to that for the high school pool, and substantially lower than that for actual admissions or either of the alternative policies, including affirmative action. These results, displayed graphically in the two left panels of Figure 4, strongly support the income-related conclusions from the conceptual discussion in Section II.

Though less definitively, the results regarding ethnicity also support the conceptual analysis, as is evident from the two right panels in Figure 4 (which display “Ethnicity” rows from Table 3). Compared to actual UC admissions, policy 3 would yield more proportionate representation for both Hispanic and black students – groups typically underrepresented in college admissions. Under policy 3, Hispanics would constitute 17.3 percent of the pool of admitted students, a proportion equal to 82 percent of their proportion in the high school population; under actual admissions they were represented at 71 percent of their proportion in this population. Similarly, although blacks would be represented at less than 60 percent of their proportion in the high school population under policy 3, they would constitute an 18 percent larger group than under the status quo. Fewer Asian students would be admitted under policy 3 than in actual admissions, though this means that they too would be more proportionately represented. Furthermore, under policy 3, Hispanics and blacks would be represented in proportions similar to those that existed in 1995, prior to the abolition of affirmative action. At that time, Hispanics constituted 16.5 percent of admitted students and blacks 4.6 percent; in simulations of policy 3 they constitute 17.3 and 4.2 percent respectively.

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does not include the small minority of eligible students who did not apply to UC. Similarly, the available data do not include private school, home-schooled, or out-of-state students; these students are therefore not accounted for in the policy simulations.

**Table 3: Admissions Simulations - Eligibility**

	College-Bound High School Seniors	Actual UC Admissions (Systemwide)	Admissions Simulation Criterion		
			1	2	3
			Pre-College Achievement	Affirmative Action	Underlying Ability
Family Income	Percent of Students in Income Category				
Below \$25,000	27.8	22.5	18.5	21.6	27.1
\$25,000 - \$70,000	45.7	43.2	46.1	45.7	45.5
Above \$70,000	26.5	34.3	35.4	32.6	27.4
Ethnicity	Percent of Students in Ethnic Category				
White	41.0	40.2	49.9	41.0	42.8
Asian	24.3	34.4	29.1	24.3	28.9
Black	7.0	3.4	2.3	7.0	4.0
Hispanic	21.0	14.9	11.4	21.0	17.3
Other	6.8	7.1	7.3	6.8	6.9
	Means Within the High School Population or Admitted Class				
Income	\$51,333	\$58,515	\$60,584	\$57,614	\$52,129
SAT I: Verbal + Math	1009	1156	1191	1173	1158
High School GPA	3.29	3.70	3.85	3.83	3.83

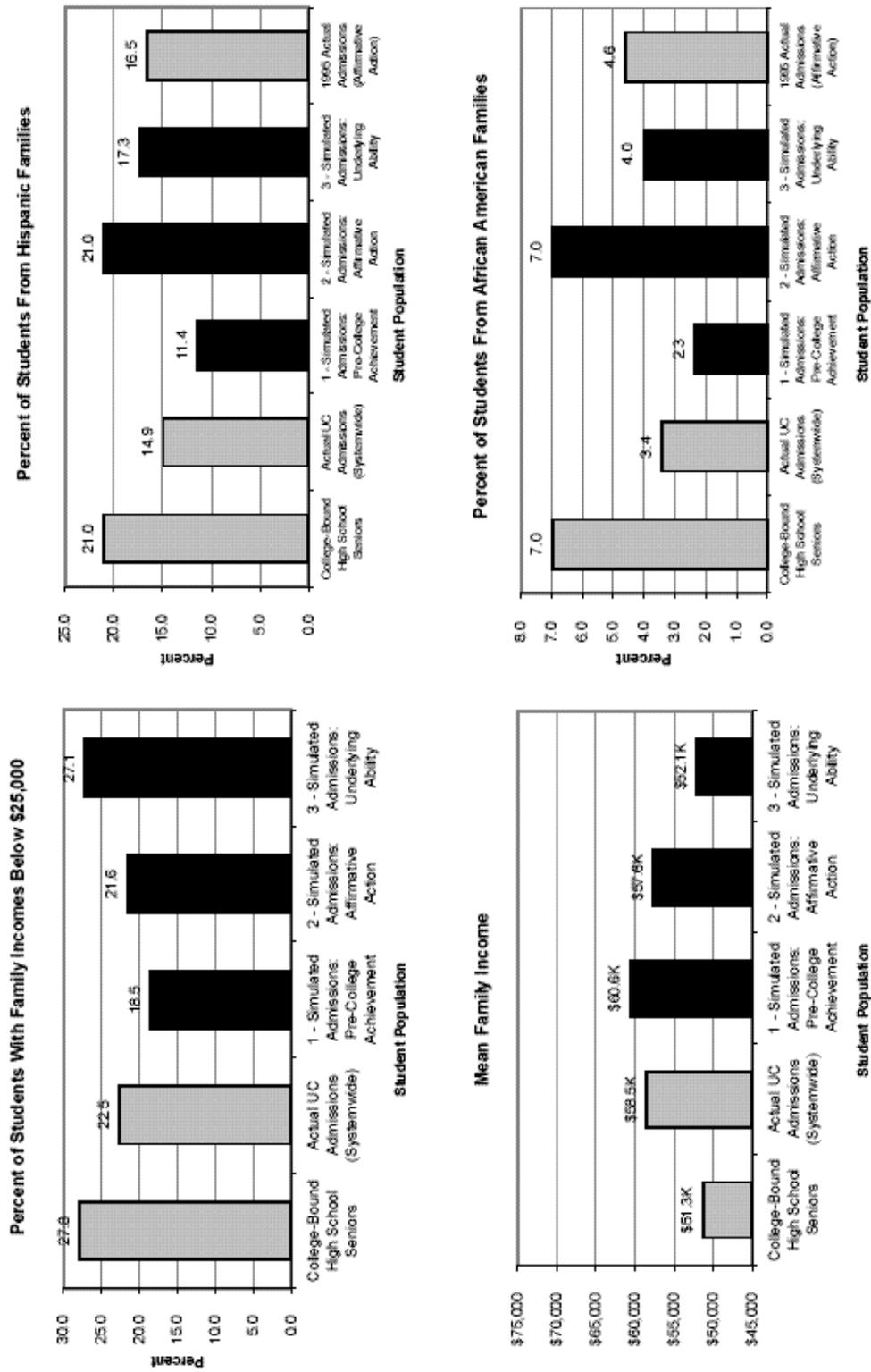
Data are from the College Board and the University of California and include 86,514 college-bound high school seniors from California public schools in 1998 for whom all data were available. (GPA and demographic variables are self-reported.) For this population, the standard deviations of income, SAT scores, and GPA are, respectively, \$35,685, 213, and 0.63. The number of students from this population that was admitted to UC, and the number admitted under each admissions simulation, is 33,566.

The actual UC admissions process, however, is more complicated, and relies on more factors, than the simulated admissions policies. Therefore, to more directly compare the ethnic distributions from admissions based on realized achievement versus admissions based on underlying ability, we can compare the simulation outcomes for policies 1 and 3. Under policy 1, the Hispanic and black proportions in the pool of admitted students would be 11.4 and 2.3 percent. Under policy 3, these proportions would rise to 17.3 and 4.0 percent – increases of 52 and 74 percent, respectively. All else equal, therefore, admissions based on a measure of underlying ability can substantially increase ethnic representation over admissions based on a measure of realized achievement.<sup>14</sup>

These ethnic outcomes are remarkable because policy 3 omits all consideration of ethnicity: it is a factor neither in the selection criterion – which is constructed from the prediction equations that omit ethnicity (model IV) – nor in the criterion’s design.

<sup>14</sup> Furthermore, this comparison of otherwise identical policies suggests that substituting measures of underlying ability for measures of realized achievement in the actual admissions process might yield a greater increase in ethnic representation over actual admissions than was obtained by the policy 3 simulation.

Figure 4: Admissions Simulations - Eligibility Selected Demographic Characteristics



(In contrast, one could design a policy that attempts to attain, through the consideration of circumstance, a target ethnic distribution.<sup>15</sup>) Policy 3 is deliberately intended only to address unequal circumstance. Doing so, however, helps to remedy ethnic inequality as well.

Table 3 also presents means for the measures of pre-college achievement: SAT and GPA. Policy 3, which has income and ethnic distributions more closely representative of the high school population than does actual admissions, also has higher grades and higher test scores. This counterintuitive result occurs because some students with very high grades and test scores did not apply to UC and because some students admitted under policy 3 may not have met UC's course pattern requirement.<sup>16</sup> Perhaps more important, therefore, is a comparison of achievement measures across the three simulated policies. Mean SAT score for admissions based on underlying ability is 31 points lower than for admissions based on realized achievement and 15 points lower than under affirmative action; mean GPA is nearly identical across the three simulations. These differences in measured achievement are small, and they exist because policy 3 explicitly considers the context in which achievement occurs. Furthermore, by design, students admitted under policy 3 would have a higher underlying ability, as measured by SAT and GPA residuals, than students admitted under the alternative policies.

### **Results: "Selection" Simulations**

Table 4 and Figure 5 display outcomes from admissions policy simulations for a hypothetical, and highly selective, UC campus. From the pool of 33,566 students known to be eligible for UC (i.e., from those admitted to at least one campus), each simulation selects the top 25 percent of students according to one of the three alternative criteria. The affirmative action simulation (policy 2) was designed to reproduce the ethnic distribution from the pool of eligible students, rather than that from the population of college-bound high school seniors.

Under the two policies that do not account for circumstance, the income distribution for admitted students would be skewed dramatically upwards. Under either of these policies, the proportion of students from low-income families would be about half their proportion in the high school population and no more than about two-thirds their proportion in the pool of eligible students. Mean incomes under these policies would be considerably higher than in the high school population or the pool of eligible students. In contrast, policy 3, which considers circumstance, would produce a nearly identical income distribution to that in the high school population

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<sup>15</sup> Pashley and Thornton (2002) develop a procedure for admitting a law school class under just such a policy, using an optimization technique that constrains the pool of admitted students to have a specific demographic profile and, subject to this constraint, selects the pool with the highest combination of grades and test scores. Without using ethnicity as an explicit criterion (although they do consider the ethnic distributions of the applicant's area of residence and undergraduate school), they can prescribe other demographic criteria in a manner that yields a desired ethnic distribution.

<sup>16</sup> More than two-thirds of the students admitted under the policy 3, however, were in fact admitted to UC and are thus known to have met the course pattern requirement. The displacement policy 3 would cause to actual admissions, in this simulation, is 10,592 out of 33,566 (32%).

(and one that is skewed *downward* relative to the pool of eligible students). As with the eligibility simulations, the selection simulations confirm the circumstance-related outcomes predicted by the conceptual analysis.

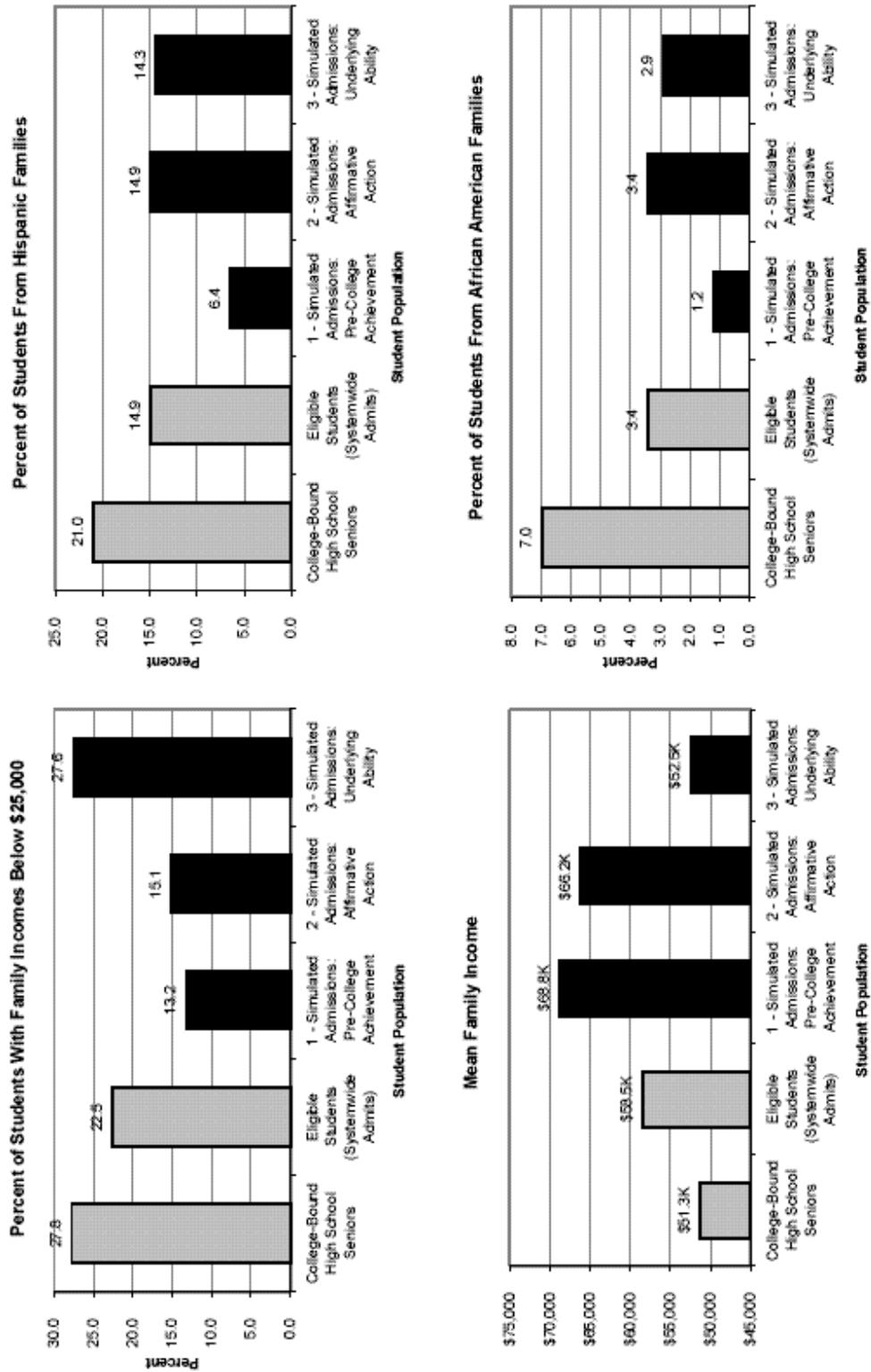
**Table 4: Admissions Simulations—Selections**

	College-Bound High School Seniors	Eligible Students (Systemwide Admits)	Admissions Simulation Criterion		
			1 Pre-College Achievement	2 Affirmative Action	3 Underlying Ability
Family Income	Percent of Students in Income Category				
Below \$25,000	27.8	22.5	13.2	15.1	27.6
\$25,000 - \$70,000	45.7	43.2	42.1	43.3	44.2
Above \$70,000	26.5	34.3	44.7	41.5	28.2
Ethnicity	Percent of Students in Ethnic Category				
White	41.0	40.2	47.6	40.2	39.2
Asian	24.3	34.4	37.2	34.4	36.7
Black	7.0	3.4	1.2	3.4	2.9
Hispanic	21.0	14.9	6.4	14.9	14.3
Other	6.8	7.1	7.5	7.1	6.8
	Means Within the High School Population or Admitted Class				
Income	\$51,333	\$58,515	\$68,845	\$66,173	\$52,480
SAT I: Verbal + Math	1009	1156	1344	1333	1283
High School GPA	3.29	3.70	4.14	4.14	4.11

Data are from the College Board and the University of California and include 86,514 college-bound high school seniors from California public schools in 1998 for whom all data were available. (GPA and demographic variables are self-reported.) The number of students from this population that was admitted to UC is 33,566. The number used for each simulation is 25% of this figure, or 8,392.

As regards underrepresented ethnic minorities, Hispanic and black students would be represented under policy 3 at more than double their representation under policy 1. While policy 3 would leave their proportions somewhat lower than in the high school population, it would nonetheless yield proportions close to those in the pool of eligible students: blacks would be represented at 85 percent of their proportion in this pool, and Hispanics would be represented at 96 percent. Asian students, a minority group that tends not to be underrepresented in college admissions, would also be represented closer to their proportion in the pool of eligible students under policy 3 than under policy 1.

Figure 5: Admissions Simulations - Selection Selected Demographic Characteristics



Students selected under policy 3 would also have high levels of measured achievement. Their mean SAT score would be 274 points above that in the high school population and 127 points above that in the pool of eligible students. It would be 61 points lower than the mean SAT for students admitted under a policy 1 – a significant amount, but not unexpected since policy 1 selects students with the highest test scores and high school grades, irrespective of the context in which those scores and grades were achieved. More surprising is that mean GPA for the students selected under policies 1 and 3 are quite similar: 4.14 for the former, and 4.11 for the latter.<sup>17</sup> Furthermore, as noted under the eligibility simulations, students admitted under policy 3 would have higher mean SAT and GPA residuals – that is, higher means in the measures of achievement that account for circumstance – than students admitted under the alternative policies.

## V. DISCUSSION AND CONCLUSIONS

Many, if not most, selective colleges and universities consider student circumstance when making admissions decisions. Most, if not all, however, do so in an ad hoc way, either based on a subjective assessment of a student's application or by some type of arbitrarily determined preferential treatment of students from disadvantaged backgrounds. In contrast, the analyses presented here demonstrate how a systematic, objective, and thorough consideration of circumstance might be used to "level the socioeconomic playing field" in college admissions. By using statistical estimates of the relationship between achievement and circumstance, we can construct an index of achievement that accounts for the role of circumstance. This index can be interpreted as a measure of underlying ability (broadly construed to include effort, motivation, etc.), potential pre-college achievement, or realized achievement in the context of circumstance. Admissions simulations based on this index demonstrate that the systematic consideration of circumstance can redress socioeconomic inequality in college admissions while maintaining academic standards.

Systematically accounting for socioeconomic inequality would also help to reduce ethnic disparities. As Table 2 shows, much of the ethnic differences in SAT I scores, and some of the ethnic differences in high school GPA, can be attributed to the fact that Hispanic and black students tend to have less advantaged circumstances than white students. A simulation of systemwide 1998 UC admissions, using a criterion that accounts for circumstance, yields an ethnic distribution that (i) rivals what UC attained in 1995 under affirmative action, (ii) is more representative than the distribution attained in actual 1998 admissions, and (iii) is much more representative than a simulation using a criterion that doesn't account for circumstance.

While ethnic disparities were reduced by a consideration of circumstance, they were not eliminated. One explanation may be that, despite the robust set of variables in the data, circumstance remains inadequately characterized. Just as ethnic

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<sup>17</sup> The larger relative discrepancy for mean SAT than for mean GPA between policies 1 and 3 may be an artifact of the relatively discrete nature of the GPA data, which are reported as 4.3 (A+), 4.0 (A), 3.7 (A-), 3.3 (B+), etc. If GPA were a more continuous variable, it is possible that the mean GPA difference between these two policies would become larger while the mean SAT difference would become smaller.

differences in SAT I scores were reduced by the inclusion of family characteristics and then further reduced by the inclusion of school and neighborhood indicators, a more refined set of characteristics might reduce the remaining differences still further. Another potential explanation is different cultural experiences across ethnic groups – whether internally perpetuated, as argued by John McWhorter (2000), or socially imposed, as Glenn Loury (2002) and Patricia Williams (1998) contend. Either explanation – inadequate data on circumstance or dissimilar cultural experiences – suggests that the explicit consideration of ethnicity in admissions may be warranted. That is, in addition to family, school, and neighborhood characteristics, ethnicity may be a valid descriptor of circumstance. Indeed, separate policy 3 simulations that include ethnicity as a variable in SAT and GPA predictions (that is, simulations based on predictions from model III rather than model IV) yield ethnic distributions that are more representative of the high school population than the reported policy 3 simulations that omit ethnicity. The income distributions and mean SAT and GPA, however, remain nearly identical with those from the reported simulations.<sup>18</sup>

To implement policy 3, a college would need to collect information on student circumstance and use the apparatus developed herein to construct measures of achievement that account for circumstance. Most colleges already collect the necessary information, and, once set up, the statistical apparatus would be straightforward to maintain. Colleges, including individual UC campuses, could introduce the GPA and SAT residuals into their existing admissions frameworks, whether they rely exclusively on quantitative information or whether they subjectively evaluate some or all of their applicants. Alternatively, colleges could use these residuals to systematize the contextual evaluation of applicants, allowing them to devote more personnel to subjectively evaluating borderline cases. In all cases, regardless of the admissions process a college uses, these statistics would provide decision makers with information not currently at their disposal: a measure of each applicant's underlying ability or achievement in the context of circumstance.

At the UC systemwide level, SAT and GPA residuals could be used to admit by exception promising students who wouldn't otherwise be eligible for UC.<sup>19</sup> Alternatively, eligibility rules could be redesigned using required minimum SAT and GPA residuals – that is, minimum levels of achievement in context.<sup>20</sup> This is unlikely, however, because it is more complicated than current eligibility rules, hence less transparent to students and parents. It could also be misinterpreted as altering test scores and grades, rather than correctly interpreted as incorporating scores and grades into measures of achievement that account for circumstance.

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<sup>18</sup> In policy 3 “eligibility” simulations that include ethnicity as a component of circumstance, Hispanic representation is 19.8%, black representation is 6.6%, mean family income is \$52,179, mean SAT is 1155, and mean GPA is 3.82. In policy 3 “selection” simulations that include ethnicity, Hispanic representation is 18.5%, black representation is 5.8%, mean family income is \$53,080, mean SAT is 1281, and mean GPA is 4.11.

<sup>19</sup> Details of UC admissions policy – including eligibility, selection, and admissions by exception – are discussed in Section IV, page 16.

<sup>20</sup> Yet another option would be for UC to abandon the “eligibility” aspect of its admissions policy altogether. UC could still set minimum requirements, but satisfying these requirements would not necessarily guarantee admission to a UC campus. Campuses would then be free to admit more high ability students from disadvantaged circumstances.

Such misinterpretation is one of the main criticisms of the systematic consideration of circumstance in admissions. In 1999 the Educational Testing Service (ETS), which develops the SAT examinations for the College Board, considered providing colleges with “a richer context for [test] scores” for those applicants whose SAT scores fall into the range of 1000 to 1190 (ETS, 1999). The proposal, based on the aforementioned research by Carnevale and Haghigat (1998), was to designate as “strivers” the students in this range who scored at least 200 points higher than predicted. It was criticized in the *Wall Street Journal* (Marcus, 1999) and other media outlets because it was perceived as altering test scores and because one version of the proposal would have included ethnic background in determining which students were strivers. In short order, the College Board announced that it would not support the endeavor, and ETS withdrew the idea from consideration.

ETS may have been wise to backpedal from controversy, but it was not altering scores and was, in fact, advocating a practice in which colleges have long engaged: evaluating achievement in light of individual circumstance. What is unique about both the Strivers approach and the approach explored in this paper is that they propose methods of *systematically* accounting for circumstance, and of doing so according to its actual effect on pre-college achievement. As demonstrated above, both conceptually and empirically, a systematic consideration of circumstance (policy 3) is quite different from affirmative action (policy 2): the former treats all ethnic groups equally, selects students with the highest underlying ability, and would admit a significantly different group of students than would an affirmative action policy. Test scores would not be altered and would continue to serve as measures of realized achievement; GPA and SAT residuals would, in contrast, provide measures of achievement in context. Critics of the Strivers proposal might have more readily received these distinctions if the entity making the proposal had not been the same one that develops the SAT, or if ETS had been more assertive in making its case.

Another concern about the systematic consideration of circumstance is that it might encourage students to falsely report their circumstance. Currently, however, many colleges rely on self-reported contextual information to subjectively evaluate applicants. Verification procedures, coupled with penalties for falsification, have proven to be an effective deterrent to misreporting.<sup>21</sup> If a college simply constructed a measure of achievement in context from the information it currently collects, the incentive for dishonesty would not necessarily increase. If it did, perhaps due to greater public awareness of the role of circumstance in admissions decisions, verification processes could be strengthened. Students who chose not to report circumstance would be treated the same as students from relatively advantaged backgrounds.

Perhaps the most significant critique of considering circumstance is that students from disadvantaged backgrounds may be academically unprepared for college despite having excelled relative to their socioeconomic peers. This topic is worthy of further study: What are the respective contributions of underlying ability and realized achievement to college success? Can disadvantaged students catch up to their more advantaged peers? How large of an educational disadvantage can be overcome? Despite these unresolved questions, however, selective colleges

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<sup>21</sup> See, for example, UC (2002), pp.19-21.

typically get many more qualified applicants than they can accommodate, and it is reasonable to suspect that high-ability candidates who would be excluded under a policy that emphasizes realized achievement would nonetheless be likely to succeed at these institutions. There would certainly be no harm in complementing subjective appraisals of students' chances for success with a statistical measure of their underlying ability. For students whose preparation is deemed insufficient, academic remediation – whether pre- or post-matriculation – could be required as an alternative to denial of admission.<sup>22</sup> Furthermore, retention efforts and academic counseling would likely be most successful when targeted to this group of high-ability students.

In summary, the mission of a selective university, and indeed the mandate from the University of California Regents, is to offer a rigorous and enlightening education to the most motivated and capable students. Economic and social circumstance often stand as barriers to this mission, limiting access to disadvantaged students and, as a consequence, diminishing the educational experience for an entire student body. The present research demonstrates that an admissions policy that systematically accounts for circumstance holds promise as a feasible, fair, and effective remedy for socioeconomic and ethnic disparity in college admissions.

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<sup>22</sup> This philosophy underlies a recent UC initiative called the Dual Admissions Program (DAP). Under this program, students who's grades in a college preparatory curriculum rank them in the top 12.5%, but below the top 4%, of their high school class will be admitted to a specific UC campus, regardless of their admissions test scores, provided they first successfully complete a transfer program at a two-year state college. (Since 2001, students in the top 4% of their class have been automatically admitted directly to a UC campus under a program called Eligibility in the Local Context.) In addition to the admission guarantee, DAP students will receive academic guidance and financial assistance from UC while in their transfer program.

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