Race-Conscious Admissions and Inter-Racial Contact: Does Homophily Matter?

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Abstract

Two recent U.S. Supreme Court rulings have affirmed the constitutionality of certain types of racial preferences in college admissions. The main premise behind the Supreme Court's decisions was that affirmative action benefits not only the minority students targeted by the policy, but majority students as well. The purported benefit to majority students is rooted in an increased likelihood of inter-racial contact associated with increased minority representation on campus. However, affirmative action itself may not foster these relationships. We show that inter-racial relationships are more likely to form among students of comparable test scores. Simulations suggest that less aggressive admissions policies would actually increase inter-racial contact by reducing the disparities between majority and minority student characteristics.

Key Words: Affirmative Action, social stratification, diversity.

JEL: I2, J15, K0

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1 Introduction

In 2003, two U.S. Supreme Court rulings (*Gratz v. Bollinger* and *Gruttinger v. Bollinger*) affirmed the constitutionality of certain types of racial preferences in college admissions. The main premise behind the Supreme Court's decisions was that affirmative action benefits not only the minority students targeted by the policy, but majority students as well. The purported benefit to majority students is rooted in an increased likelihood of inter-racial contact associated with increased minority representation on campus.

In this paper we hope to identify how increasing racial diversity affects inter-racial contact as well as what affirmative action policies would maximize inter-racial contact across all universities. We first develop three models of inter-racial contact: one where the characteristics of the individual do not affect the probability of interaction, one where characteristics that affect what school the individual attends also affect the probability of interaction, and one where individuals statistically discriminate on these same characteristics. The models have different predictions regarding interaction rates as well as different interaction maximizing affirmative action policies.

We then test the empirical predictions of the models using data from the College & Beyond. The College & Beyond data set provides administrative records at thirty selective colleges in the United States as well as information from a follow-up survey conducted roughly seven years after matriculation. This the same data set used in Bowen and Bok's seminal book *The Shape of the River*. We use self-reported measures of whether individuals got to know members of particular groups well from the 1989 cohort. We then relate these measures to the racial mix and characteristics of the school.

Increased representation is associated with more inter-racial contact. Contact is particularly high at the top tier schools as these schools are the most diverse in our data set. Indeed, national data reveals a U-shaped pattern between college quality (as measured by average SAT score) and the share of black students at the school. If all individuals were identical, inter-racial contact would be maximized when the share of black students was constant across schools. Since affirmative action is only relevant at the most selective institutions (see Kane, 1998 and Arcidiacono, 2005), less aggressive policies would lead to more inter-racial interaction.

However, individuals are not identical and in fact are more likely to interact with individuals who have similar characteristics to their own. We find that individuals with SAT scores

above their school mean are significantly less likely to interact with blacks, a group whose average SAT score was 170 points below their white counterparts. On the other hand, whites with SAT scores above their school mean are more likely to interact with Asians, a group whose average SAT score is 50 points higher than their white counterparts.

To examine these issues in more detail, we consider a model where the probability of interaction between students depends on the degree of observable similarity between them. In the sociology literature, such models of "homophily" have long received empirical support (Carli et al., 1991; Henderson and Furnham, 1985; Kandel, 1978; McPherson and Smith-Lovin, 1988). The economic modeling of friendship formation is still in its infancy. Foster (2003) and Sacerdote (2004) are noteworthy exceptions and also find evidence of homophily. In such a model, affirmative action policies might have a perverse effect on interracial interaction by introducing or exacerbating disparities between majority and minority students. We then estimate a model where the probability of inter-racial interaction is a function not only of the racial composition of one's major cohort, but also of how similar one's own test scores are to those of other racial groups. We find that individuals are most likely to interact with individuals of other races if those individuals have similar test scores to their own. In other words, students appear to socially stratify themselves by characteristics that correlate strongly with their test scores: cross-race interaction is most likely to occur within these strata. Increasing racial diversity of the group of individuals with SAT scores more than 160 points below one's own SAT score has very little impact on the probability of inter-racial interaction.

The empirical results also suggest some scope for statistical discrimination. Increasing racial diversity of the group of individuals with SAT scores more than 160 points above one's own SAT score had as a much of an effect on inter-racial contact as diversity within plus or minus 160 points of one's own score. This is consistent with a model where individuals receive a noisy signal on the value of contact with other individuals and that this signal is related to an individual's test score and the underlying distribution of academic preparation. Well prepared black students are penalized by this statistical discrimination as the presence of those with poor backgrounds has negative effects on the expectations of non-blacks.

This suggests that affirmative action, which by definition introduces a mismatch in the test scores and other credentials of over- and under-represented racial groups, may have little to no impact on inter-racial interaction or, worse, may actually have a negative effect. To gauge the impact of affirmative action on inter-racial contact, we perform a simulation that subjects under-represented minorities to the same assignment rules in the College & Beyond

institutions as the majority. We then use the simulated racial composition of each institution and our previous regression results to predict the amount of inter-racial interaction that would occur. Although the simulation suggests that the elimination of affirmative action would on net reduce the representation of minorities at these selective colleges, the overall predicted amount of inter-racial interaction actually *increases*.[1] This effect would not be uniform across institutions: the handful of most-selective colleges would witness a decrease in inter-racial contact. Hence, if inter-racial contact is valued by these universities, they have every incentive to support affirmative action even though it comes at the expense of even more inter-racial contact at lesser-ranked institutions.

This paper is meant to be a positive analysis of minority representation, interracial interaction, and the self-perceived quality of higher education. Our results suggest that the facts are inconsistent with legal arguments made in favor of affirmative action in higher education. Any complete normative analysis of affirmative action must consider other equity and efficiency aspects of racial preferences in admissions, and this paper has nothing to say regarding those criteria.[2] The most appropriate normative conclusion from this paper is that affirmative action is an insufficient policy for increasing the degree of interracial contact on college campuses.

The rest of the paper proceeds as follows. Section 2 presents the models of inter-racial interaction. Section 3 describes the data and methods used in the analysis. Section 4 examines the factors that influence inter-racial interaction. Section 5 describes the structural model with the results presented in Section 6. Section 7 shows the policy simulations. Section 8 concludes.

2 Models of Inter-racial Contact

To motivate the discussion of the models, we first examine what the relationship is between percent black and college quality. In particular, we use the average SAT score of the student body as our measure of college quality. We collected data from the Princeton Review Best 357 colleges on percent black and average SAT scores of the schools.[3] Figure 1 fits a fractal

[1]The total increase is if anything understated, since minority students not admitted to one of the C&B institutions in our simulation would most likely matriculate at a somewhat less-selective college, decreasing the majority-minority achievement mismatch at that institution.

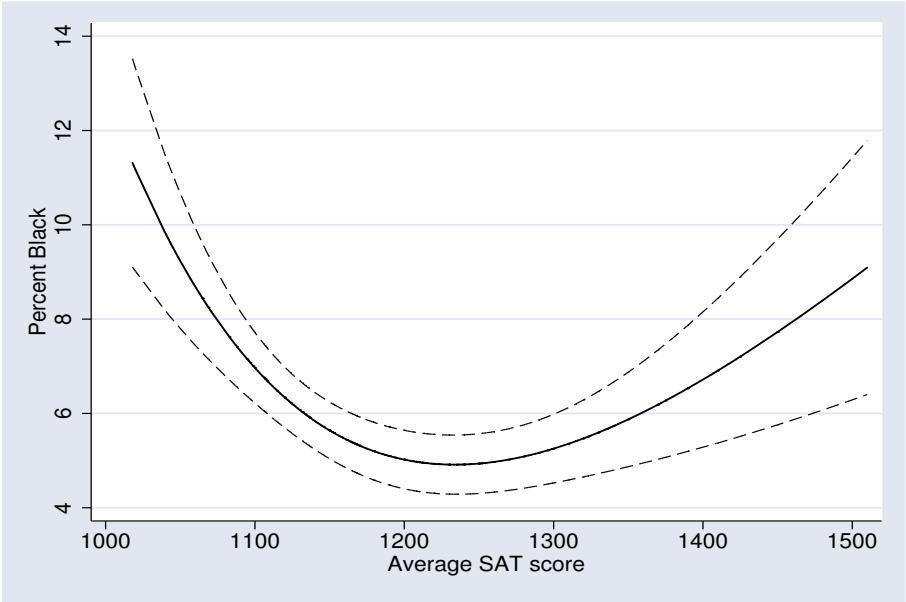
[2]For studies of other aspects of the impact of collegiate racial composition on graduate outcomes, see Arcidiacono and Vigdor 2005 and Duncan et al. 2003.

[3]Some schools—particularly those at the very top— did not report their average SAT score. For these schools we used data from America's Best Colleges 2005 produced by U.S. News & World Report. The U.S.

polynomial of average SAT scores to percent black. The results are weighted by enrollment, but the unweighted results are similar and presented in the Appendix.

Plotting percent black as a function of average SAT score yields a U-shaped pattern: the most selective schools have a higher percent black than the tier immediately below them. Figure 2 displays the same table by region and in all region the U-shaped pattern emerges. This U-shaped pattern holds despite blacks scoring substantially worse on the SAT than their white counterparts.

Figure 1: College Percent Black as a Function of Average SAT Score[†]

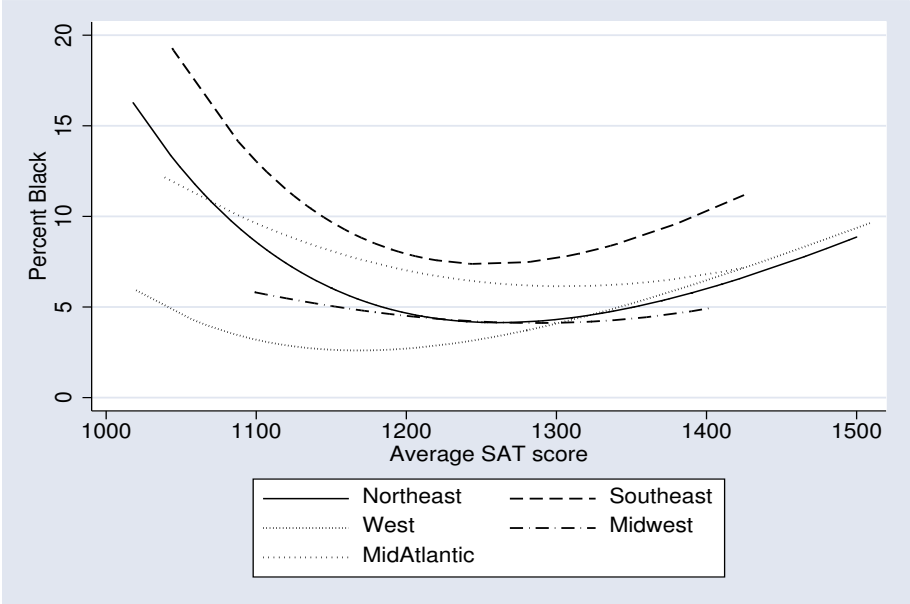


The U-shaped pattern suggests that higher percent black at top-tier schools may come at the expense of higher percent black at the next tier down. Indeed, affirmative action in college admissions has been shown to have little effect on admissions at most schools (see Kane 1998 and Arcidiacono 2005) and in turn little effect on the overall attendance rates of blacks (Arcidiacono 2005). Affirmative action in college admissions then primarily affects which colleges blacks attend conditional on attending at all.

Against this backdrop, we develop three models of inter-racial contact across universities where one group has substantially lower test scores than the other group. None of the three cases yield a U-shaped pattern as the optimal assignment rule given the objective of maximizing inter-racial contact. The best case scenario is when inter-racial interaction does not

News & World Report data gives the 25th and 75th percentiles of the SAT distribution. For those schools not reporting an average SAT score, we used the midpoint of the 25th and 75th percentiles.

Figure 2: College Percent Black as a Function of Average SAT Score by Region†



depend upon previous academic achievement and is therefore uncorrelated with test scores. In this case, inter-racial contact is maximized when percent black is equal across all schools. However, should inter-racial contact be more likely to occur among individuals with similar academic backgrounds, top-tier schools should have a lower percent black to maximize global inter-racial contact. Top tier universities however have no incentive to do so, increasing their own inter-racial contact by a small amount through aggressive affirmative action policies at the expense of higher inter-racial interaction at lower tier schools.

2.1 Model 1: Inter-racial contact does not depend upon individual characteristics

Our first model considers the simplest case where inter-racial interaction does not depend upon background characteristics. In particular, let there be two groups of individuals, W's and B's, at each of two schools, 1 and 2. For each of the models we take the number of W types at the two schools as given at N_{W1} and N_{W2}, though our results are consistent with a model where schools trade off enrollment between the two types.

Each individual is randomly assigned a match. For this base model, all matches yield successful contacts. The number of successful inter-racial contacts at school j, IC_j can be written as the number of W types at the school times the probability of being matched with

a B type:

$$IC_j = N_{Wj}\left(\frac{N_{Bj}}{N_{Wj}+N_{Bj}}\right)$$

A social planner assigning B types to schools to maximize inter-racial contact solves:

$$\max_{N_{B1},N_{B2}} N_{W1}\left(\frac{N_{B1}}{N_{W1}+N_{B1}}\right) + N_{W2}\left(\frac{N_{B2}}{N_{W2}+N_{B2}}\right)$$
$$\text{s.t. } N_{B1}+N_{B2}=N_B$$

Substituting in for N_{B2} from the constraint and taking first order conditions then gives the optimal choice of N_{B1}:

$$N_{B1} = N_B\left(\frac{N_{W1}}{N_{W1}+N_{W2}}\right)$$

The fraction of B types assigned to school 1 is then the same fraction of W types assigned to school 1. The optimal fraction of B types assigned to each school in this simple model is then constant across schools.

Having the group shares be equal across schools minimizes the probability that an individual will be matched with a member of his own race. Since inter-racial interaction has nothing to with the characteristics of the individual, the optimal policy for maximizing inter-racial contact would yield no relationship between the share of a group at a school and the quality of the school. In the context of Figure 1, the optimal policy would yield a flat line at the share of blacks in the population that attended this set of schools. If this model is correct, differences in background characteristics should have little effect on interaction probabilities.

2.2 Model 2: Inter-racial contact depends upon similarity in academic backgrounds

While equal representation across schools will maximize inter-racial contact when interaction does not depend upon other factors, it is easy to write down situations when equal representation is not optimal once interaction depends upon the characteristics of the individuals. We now allow individuals to be one of two academic background types, H and L. To keep the proofs simple, we make the following additional assumptions about the distribution of academic experience types across race and across schools as well as the relationship between academic experience and the probability of a successful contact:

1. The probability of being type H given race W is 0.5: $N_{WH} = N_{WL}$.

2. School 2 has relatively more W types with characteristic H than school 1:

$$\begin{aligned} N_{W1} &= \alpha N_{WL} + (1-\alpha) N_{WH} \\ N_{W2} &= (1-\alpha) N_{WL} + \alpha N_{WH} \end{aligned}$$

where $0.5 \leq \alpha < 1$.

3. The distribution of academic experience is such that W types are more likely to have academic experience H: the probability of an individual of race B begin the L type is $\pi_{BL} > 0.5$.

4. The social planner must assign at least α of each academic experience type to each of the schools.[4]

5. Conditional on matching, the probability of a successful contact is 1 if the academic experiences are the same and $\gamma < 1$ if the academic experiences are different.

This last assumption ensures that similarity in the characteristic matters at every school.

We then examine the optimal assignment policies for B types under these assumptions. First, note that it is optimal to assign as many member of group B with academic experience H as possible to school 2: $N_{BH2} = \alpha N_{BH}$. The issue is then how to distribute members of group B of type L across the two schools. Let β represent the fraction of L type blacks assigned to school 1. Inter-racial contact at each of the schools is given by:

$$IC_1 = \alpha N_{WL} \left(\frac{\beta N_{BL} + \gamma(1-\alpha) N_{BH}}{N_{W1} + N_{B1}} \right) + (1-\alpha) N_{WH} \left(\frac{\gamma\beta N_{BL} + (1-\alpha) N_{BH}}{N_{W1} + N_{B1}} \right) \quad (1)$$

$$IC_2 = \alpha N_{WH} \left(\frac{\gamma(1-\beta) N_{BL} + \alpha N_{BH}}{N_{W2} + N_{B2}} \right) + (1-\alpha) N_{WL} \left(\frac{(1-\beta) N_{BL} + \gamma\alpha N_{BH}}{N_{W2} + N_{B2}} \right) \quad (2)$$

To show that there should be a lower fraction of B types at school 2, we first find the β that leads to equal representation: β_{ER}. Next, we show that the derivative of inter-racial contact is positive with respect to β when evaluated at β_{ER}. The value of β that leads to equal to representation, β_{ER} is given by:

$$\beta_{ER} = \frac{1}{2} + \frac{(2\alpha - 1)(1 - \pi_{BL})}{2\pi_{BL}}$$

Note that at $\pi_{BL} = 1/2$, $\beta_{ER} = \alpha$. Further, with $\alpha > 1/2$ the expression is decreasing in π_{BL}. With $\pi_{BL} > 1/2$, $\beta_{ER} < \alpha$.

[4]This assumption ensures that there is some diversity in academic background for each race at each school.

Let $IC = IC_1 + IC_2$. Taking the partial derivative with respect to β yields:

$$\begin{aligned}
\frac{\partial IC}{\partial \beta} &= \alpha N_{WL}\left(\frac{N_{BL}}{N_{W1}+N_{B1}} - \frac{(\beta N_{BL}+\gamma(1-\alpha)N_{BH})N_{BL}}{(N_{W1}+N_{B1})^2}\right) \\
&+(1-\alpha)N_{WH}\left(\frac{\gamma N_{BL}}{N_{W1}+N_{B1}} - \frac{(\gamma\beta N_{BL}+(1-\alpha)N_{BH})N_{BL}}{(N_{W1}+N_{B1})^2}\right) \\
&+(1-\alpha)N_{WL}\left(-\frac{N_{BL}}{N_{W2}+N_{B2}} + \frac{((1-\beta)N_{BL}+\gamma\alpha N_{BH})N_{BL}}{(N_{W2}+N_{B2})^2}\right) \\
&+\alpha N_{WH}\left(-\frac{\gamma N_{BL}}{N_{W2}+N_{B2}} + \frac{(\gamma(1-\beta)N_{BL}+\alpha N_{BH})N_{BL}}{(N_{W2}+N_{B2})^2}\right)
\end{aligned}$$

If $\gamma = 1$ we are back to the case where similarity in academic background does not matter. We can write the derivative above evaluated at β_{ER} as a function of the first order condition from the maximization problem when academic background did not matter plus additional terms. Since equal representation involved setting this first order condition equal to zero, the sign of the additional terms determines the sign of the expression. Substituting in such that the partial derivative is only a function of N_W, N_B, π_{BL}, α, and β_{ER}, the partial derivative evaluated at β_{ER} is then given by:

$$\begin{aligned}
\frac{\partial IC}{\partial \beta}|_{\beta_{ER}} &= \frac{\alpha N_W}{N_W+N_B}\left[\frac{(1-\gamma)(1-\alpha)(1-\pi_B)\pi_B N_B^2}{N_W+N_B}\right] \\
&+\frac{(1-\alpha)N_W}{N_W+N_B}\left[-(1-\gamma)\pi_B N_B + \frac{(1-\gamma)\beta\pi_B^2 N_B^2}{N_W+N_B}\right] \\
&+\frac{(1-\alpha)N_W}{N_W+N_B}\left[-\frac{(1-\gamma)\alpha(1-\pi_B)\pi_B N_B^2}{N_W+N_B}\right] \\
&+\frac{(1-\alpha)N_W}{N_W+N_B}\left[(1-\gamma)\pi_B N_B - \frac{(1-\gamma)(1-\beta)\pi_B^2 N_B^2}{N_W+N_B}\right]
\end{aligned}$$

implying that the sign evaluated at β_{ER} is given by:

$$sign\left(\frac{\partial IC}{\partial \beta}|_{\beta_{ER}}\right) = \alpha\left[\frac{N_W}{2}+\alpha(1-\pi_B)N_B\right] - (1-\alpha)\left[\frac{N_W}{2}+(1-\alpha)(1-\pi_B)N_B\right]$$

Since $\alpha > 0.5$, the derivative is positive at β_{ER}. With β representing the fraction of group of B of type L assigned to the lower quality school, when academic background matters it will be optimal to have B types disproportionately represented at the lower quality school.

In addition to equal representation not being optimal in this case, it is important to note that when academic background is observable there is a symmetry in the match probabilities once we condition on academic background. Namely, a member of group W with type L who has been assigned a member of group B of type H has the same probability of matching as a member of group W of type H who has been assigned a member of group B of type L. This does not hold in the case of statistical discrimination discussed below and is crucial in

separating the components of mismatching into information and true difference in academic backgrounds.

2.3 Model 3: Inter-racial contact depends upon similarly in previous academic experiences and individuals statistically discriminate.

The problem with matching based upon academic experience can be recast with γ serving as the benefit of a match between two individuals of different academic experiences. There is then a cost of forming a match which is borne by one of the individuals. Which individual bears the cost is exogenously assigned and costs are assumed to be distributed uniformly on the zero-one interval. If academic experience is perfectly observed before an individual decides to pay the cost of accepting the match with someone of a different academic experience type then the probability the individual will accept the match is γ.

The advantage of recasting the problem this way is that it can be easily extended to the case when individuals only receive signals of their potential partner's academic experience and use this information in forming expectations about the expected benefits of engaging in the friendship. We employ the same assumptions regarding the distributions of academic experience types across the two groups as well as the assumption of how members of group W are distributed across the two schools. Now, however, individuals emit signals–signals that they have no control over– regarding their academic experience type. In particular, an individual correctly signals their type ϕ percent of the time where $0.5 < \phi \leq 1$. We assume that the W types always bear the cost though all the qualitative results hold when B types bear the cost instead.

As with the case when academic experience is observed, it will again be optimal to assign as many members of group B that are type H to school 2: $N_{BH2} = \alpha(1 - \pi_{BL})N_B$. Let β again represent the fraction of L types from group B that are assigned to school 1. Let $P(M|A, S, j)$ be the probability a W type will accept a match given his academic experience is A, given he has received a signal S from his potential partner, and given that he is at school j. This probability for someone of academic experience L, who has seen a signal H at school 1 is given by:

$$P(M|L, H, 1) = \gamma \left(\frac{\phi(1-\alpha)(1-\pi_{BL})}{\phi(1-\alpha)(1-\pi_{BL}) + (1-\phi)\beta\pi_{BL}} \right) + 1 \left(\frac{(1-\phi)\beta\pi_{BL}}{\phi(1-\alpha)(1-\pi_{BL}) + (1-\phi)\beta\pi_{BL}} \right)$$

where the first term gives the benefit of matching with an H type conditional on being an L type times the probability that the individual he is matched with is an H type given the H

signal and given the distribution of types at school 1. The second term is similar except that now it is the benefit and the conditional probability of the individual being an L type.

We can now perform the same analysis as before: calculate the partial derivative of the inter-racial contact function with respect to β and evaluate it at β_{ER}. If the partial derivative evaluated at β_{ER} then it is optimal to assign relatively more B types to school 1 than school 2. However, the optimal assignment rule is exactly the same as in the case with academic experience matching but no statistical discrimination. To see this, consider the number of inter-racial contacts generated by from matches including L types who are members of group W at school 1. This number is given by:

$$\begin{aligned} IC_{L1} \quad &= \alpha N_{WL}\Bigg[\quad \left(\frac{N_B(\phi(1-\alpha)(1-\pi_{BL})+(1-\phi)\beta\pi_{BL})}{N_{W1}+N_{B1}}\right)\left(\frac{\gamma\phi(1-\alpha)(1-\pi_{BL})+(1-\phi)\beta\pi_{BL})}{\phi(1-\alpha)+(1-\phi)\beta\pi_{BL}}\right) \\ &\quad + \left(\frac{N_B((1-\phi)(1-\alpha)(1-\pi_{BL})+\phi\beta\pi_{BL})}{N_{W1}+N_{B1}}\right)\left(\frac{\gamma(1-\phi)(1-\alpha)(1-\pi_{BL})+\phi\beta\pi_{BL})}{(1-\phi)(1-\alpha)+\phi\beta\pi_{BL}}\right)\Bigg] \end{aligned}$$

The term on the first line gives the probability of meeting a B type and seeing the H signal times the probability of accepting a match given an H signal was seen. The second line then gives the similar expression for the H signal. Note that this expression simplifies to:

$$IC_{L1} = \alpha N_{WL}\left(\frac{\beta N_{BL}+\gamma(1-\alpha)N_{BH}}{N_{W1}+N_{B1}}\right)$$

which is exactly the same as the corresponding term when academic experience is observed without noise. The terms for IC_{H1}, IC_{L2}, and IC_{H2} also match so that the β which maximizes inter-racial contact when academic experience is observable is the same as the β which maximize inter-racial contact when academic experience is measured with noise. Hence, to maximize inter-racial contact B types will be disproportionately represented at school 1.

Note that although the best choice of β is the same across the two cases the symmetry present in the observable academic experience case is not present here. In particular, conditional on matching with someone of the opposite academic experience type, the probability the match is accepted is no longer the same for L types and H types and differs across schools as well. Consider an L type at school 2 who is matched with an H type member of group B. Label the probability of a successful match in this case as $Q(M|L,H,2)$ and is given by:[5]

$$Q(M|L,H,2) = \phi\left[\frac{\gamma\phi\alpha(1-\pi_{BL})+(1-\phi)(1-\beta)\pi_{BL}}{\phi\alpha(1-\pi_{BL})+(1-\phi)(1-\beta)\pi_{BL}}\right]+(1-\phi)\left[\frac{\gamma(1-\phi)\alpha(1-\pi_{BL})+\phi(1-\beta)\pi_{BL}}{(1-\phi)\alpha(1-\pi_{BL})+\phi(1-\beta)\pi_{BL}}\right]$$

[5]Note that $Q(M|L,H,2)$ differs from $P(M|L,H,2)$ in that in the former case the individual is actually matched with an H type while in the latter case an individual is matched with someone who has given the H signal.

The corresponding probability of an H type member of group W accepting a match with an L type member of group B conditional on assignment, $Q(M|H, L, 2)$, is:

$$Q(M|H,L,2) = \phi\left[\frac{\gamma\phi(1-\beta)\pi_{BL} + (1-\phi)\alpha(1-\pi_{BL})}{(1-\phi)\alpha(1-\pi_{BL}) + \phi(1-\beta)\pi_{BL}}\right] + (1-\phi)\left[\frac{\gamma(1-\phi)(1-\beta)\pi_{BL} + \phi\alpha(1-\pi_{BL})}{\phi\alpha(1-\pi_{BL}) + (1-\phi)(1-\beta)\pi_{BL}}\right]$$

Only special cases satisfy $Q(M|H, L, 2) = Q(M|L, H, 2)$ such as when academic experience can be seen without error or when the members of group B at school 2 are evenly divided between H types and L types. Hence, asymmetries in the match probabilities are suggestive of statistical discrimination.

3 Data

To examine the impact of collegiate diversity on inter-racial interaction, we employ the College & Beyond Data set, made available by the Andrew W. Mellon Foundation.[6] This data set contains information from two sources: administrative information on a set of mostly selective undergraduate institutions, and survey responses collected from a sample of students who matriculated at those institutions in one of three cohorts. Our analysis focuses on the 1989 entering cohort.[7] The administrative data include information on each matriculant's SAT scores, major, and ultimately their means of exit, whether graduation, transfer, or withdrawal. For most institutions, the administrative data represents the entire entering cohort. For the remainder, the data comprise a nonrandom sample of the student body. Weights are provided to adjust for this sampling. A complete list of institutions represented appears in Table A1 in the appendix. A subset of the administrative sample, approximately 40%, received and replied to a follow-up survey in 1996. This survey provides information on many outcomes of interest such as collegiate satisfaction and inter-racial interaction.

As a proxy for the characteristic A, we focus on SAT scores.[8] Table 1 shows the distribution of SAT scores relative to the school average for three groups of individuals. Blacks, non-blacks, and non-black legacies. Blacks in the College & Beyond performed much worse on

[6] We omit observations from historically black colleges as affirmative action is not relevant at these schools. We also omit observations from women's colleges as the selection into and the environment of these colleges may be substantially different from other institutions. Including data from women's colleges does not affect our results.

[7] Other cohorts available in the C&B data set include the classes entering in 1951 and 1976. We focus on the 1989 cohort because it is the most recent and more detailed questions were asked about inter-racial interaction.

[8] We experimented with other measures such as private versus public school and found little evidence that similarity in these measures mattered besides through the SAT score.

the SAT than their non-black counterparts.[9] Within a particular school, the seventy-fifth percentile of the black distribution roughly matches the twenty-fifth percentile of the non-black distribution. These large differences in SAT may mitigate inter-racial interaction if similarity in the background variables summarized in the SAT are important.

Given these differences, our initial thought was that perhaps blacks would look similar to legacies in terms of their SAT scores due to preferential admissions policies for both groups. These preferential admissions policies would then serve as a device that would encourage interaction between blacks and legacies. The third column shows that the distribution of legacy SAT scores is actually similar to non-blacks in general. Note that legacies may still receive preferential treatment in the admissions process. This is because legacies should on average have higher SAT scores than in the population as a whole. Hence, conditional on being in a particular SAT score range, we would expect legacies to be disproportionately represented at the top end.

Table 1: Distribution of SAT Scores Relative to the School Average†

SAT minus School Average SAT	Blacks	Non-Blacks	Non-Black Legacies
10th percentile	-338	-150	-138
25th percentile	-260	-65	-65
50th percentile	-167	22	11
75th percentile	-70	100	90
90th percentile	11	165	157
Mean	-164	14	10
Observations	1561	20566	1934

Table 2 examines the distribution of black SAT scores relative to the school average for three tiers of schools. Tier 1 includes with average SAT scores above 1300, tier 2 between 1200 and 1300, and tier 3 less than 1200. The gap between black SAT scores and the average SAT score is fairly similar across tiers, though the bottom end of the black distribution is relatively worse at tier 3 schools.

[9]Note that the SAT has been accused of being biased against blacks. If this is true, it will reflect our empirical results in predictable ways. We return to this in the results section.

Table 2: Distribution of Black SAT Scores Relative to the School Average By Tier†

Black SAT minus School Average SAT	Tier 1	Tier 2	Tier 3
10th percentile	-300	-339	-358
25th percentile	-233	-248	-280
50th percentile	-143	-145	-190
75th percentile	-59	-61	-85
90th percentile	7	9	20
Mean	-146	-155	-179
School Average SAT	1330	1245	1127

Our key outcome measures are the self-reported answers to whether or not individuals know two or more people from various groups well. In particular, we focus on whether non-blacks know two or more blacks well and whether whites know two or more Hispanics or asians well. Table 3 shows the proportion of individuals answering these questions affirmatively as well as the corresponding shares of blacks, Hispanics, and asians in the sample. The last three columns disaggregate the numbers by the same tiers as in Table 2.

Representation does indeed seem to be correlated with being known well by other groups. Those at tier 1 schools have the highest probabilities of knowing members from all three groups well and each of the three groups is disproportionately represented at the tier 1 schools. As we move down the tiers, the fraction of both asians and hispanics fall. This may be related to the location of the college themselves as Hispanics may be more concentrated in particular regions of the country. For blacks, however, we see the same U-shape pattern as in the national data: the middle tier schools have on average the lowest percent black.

4 Reduced Form Methods and Results

4.1 Estimation Strategy

We relate the outcome measure to observable characteristics of the individual and the school. For our baseline model, let the true number of members of a particular group that are well

Table 3: Probability of Knowing Two of More Members of a Group Well†

	Group	Population	Tier 1	Tier 2	Tier 3
	Blacks	59.8%	67.5%	56.8%	58.0%
Know 2	Asians	59.6%	81.4%	63.3%	48.1%
or More	Hispanics	30.1%	45.7%	38.1%	18.5%
	Blacks	6.4%	7.5%	5.7%	6.2%
Share	Asians	8.2%	12.9%	8.6%	5.6%
	Hispanics	3.3%	5.7%	3.5%	1.9%

known by an individual i at school j be given by:

$$Y_{ij}^{*} = \alpha_0 + X_{1i}\alpha_1 + SHR_j\alpha_2 + (SHR_j\alpha_2)^2\alpha_3 + \epsilon_{ij} \tag{3}$$

where X_{1i} refers to individual-specific characteristics that may affect inter-racial interaction or an individual's standard for knowing someone well. The SHR terms then refer to the fraction of the group in question (for example, blacks) at the school. The squared term then gets at the decreasing returns from adding more of a particular group. With the errors being normally distributed and independent from the other variables, we can get the probability of knowing two or more well from a probit where the outcome measure is $Y_{ij} = 1$ if $Y_{ij}^{*} \geq 2$. All of the α's are allowed to vary across the groups in question.

For a reduced form test of whether homophily matters, we add to the model the relative SAT score at each school. The underlying index function is then:

$$Y_{ij}^{*} = \alpha_0 + X_{1i}\alpha_1 + SHR_j\alpha_2 + (SHR_j\alpha_2)^2\alpha_3 + (SAT_i - \overline{SAT}_j)\alpha_4 + \epsilon_{ij} \tag{4}$$

If homophily is unimportant— or the SAT score is not related to the characteristic on which similarity matters— α_4 will be zero.

However, as affirmative action policies are changed, the relationship between relative SAT score and inter-racial interaction may change as well as members of a particular are on average better or worse than before the policy change. Hence, we develop a model that nests equation (3) but allows for homophily in SAT scores to matter. In particular, divide all members of the group interest into three groups: those with SAT scores 160 above their own ($HIGH$), 160 points below their own (LOW), and between plus or minus 160 points of their own score

(MED).[10] Dividing these numbers by the total member of classmates then gives the joint probability of being in the particular SAT group and in the racial group in question. We then allow increasing the shares of each of these groups to differ in their effect on inter-racial interaction. This leads to the following specification:

$$Y_{ij}^{*} = \alpha_0 + X_{1i}\alpha_1 + \mathbf{SHR_j}\boldsymbol{\alpha_2} + (\mathbf{SHR_j}\boldsymbol{\alpha_2})^2\alpha_3 + \epsilon_{ij} \tag{5}$$

where

$$\mathbf{SHR_j}\boldsymbol{\alpha_2} = SHR_{HIGHj}\alpha_{20} + SHR_{MEDj}\alpha_{21} + SHR_{LOWj}\alpha_{22}$$

Note that the coefficients on the linear term also enter into the squared term. In this way if one group has little direct benefit then that group will also have little effect on crowd out.

The above specification nests all three of the models discussed in section 2. If SAT scores are irrelevant to inter-racial interaction, then the coefficient on the three share variables will be the same. If homophily matters but there is no statistical discrimination, we would expect the coefficient on the share of the group within the SAT range to be higher than the coefficients on the other groups. However, we would also expect symmetry between the coefficients on the share of students above and the share of students below. If statistical discrimination is present and the group in question has significantly lower SAT scores than the population, the coefficient on the share of the group significantly above the individual's SAT score should be higher than the corresponding coefficient on the share of the group significantly below the individual's SAT score.

4.2 Do Similarities in SAT Scores Facilitate inter-racial Relationships?

Estimates of a baseline probit of the probability of knowing two or more blacks well are presented in Table 4. The regression was run for all non-black individuals. Variation in percent black is solely at the level of the institution and standard errors are adjusted for clustering. The specification in column 1 gives the results when the only controls are female, percent black, and percent black squared. Females are less likely to report that they know two or more blacks well and this patterns continues throughout the rest of the regression results. However, as we will see later in the paper, this seems to be because females are less likely to report that they anyone well— what is considered knowing someone well seems to differ across the sexes.

[10] 160 points corresponds to the standard deviation in SAT scores across the population of College & Beyond students.

Both percent black and percent black squared have the expected signs. With the negative squared term, an interior optimal percent black exists in terms of maximizing the chances of knowing two or more well. The interior optimum is at 10%. This may be because of self-segregation. However, having the dependent variable be knowing two or more well means that adding blacks once someone knows two or more well will have no additional effect. Hence, the squared term may be negative solely because of the definition of the dependent variable.

The second column adds the individual's SAT score relative to the school average. Those with higher SAT scores at a particular school are substantially less likely to know two or more blacks well. Given that blacks tend to be at the bottom of the within school SAT distribution, this is suggestive that similarities in the characteristics associated with SAT scores may facilitate inter-racial relationships.[11]

However, it may be the case that those with high SAT scores are more likely to have discriminatory preferences or are less likely to report that they know someone well. Column 3 adds the individual's SAT score to the regression to test whether the result is driven by high SAT score individuals being less likely to interact with blacks. The coefficient on own SAT score was small and insignificant: we cannot reject the exclusion of the individual's SAT score once we control for relative SAT score.

To further test whether similarities in SAT score are important to inter-racial interaction, we perform the same analysis except using the probabilities of knowing two or more Hispanics and asians well. Results are reported in table 5. Consistent with the results for knowing blacks, women are less likely to report that they know two or more Hispanics or asians well. The standards for knowing someone well appear to be different across the sexes.

More important are the effects of relative SAT score. Although about a third of the magnitude of the corresponding coefficient in the black regression, increasing one's SAT score relative to the school average makes interaction with Hispanics less likely. This is remarkably consistent with the fact the gap between Hispanic and white SAT scores at the school level is -58 points— about a third of the gap between black and white SAT scores. The second column displays the results for asians. Relative SAT score has the opposite effect here: higher relative scores make interaction with asians more likely. But this also consistent with homophily as asians on average scored 56 points higher than their white counterparts. Similarity in SAT scores seems to be important not only in inter-racial relationships with blacks, but also in

[11] One potential concern is that the differential effects is driven by athletes. Removing athletes had no effects on the qualitative results.

Table 4: Probit Estimates of the Relationship Between Percent Black and Knowing Two or More Blacks Well[†]

Variable	(1)	(2)	(3)
Share Black	16.15	16.40	14.26
	(3.31)	(3.22)	(7.16)
(Share Black)^2	-0.312	-0.302	-0.332
	(0.075)	(0.070)	(0.216)
Female	-0.083	-0.136	-0.136
	(0.055)	(0.059)	(0.059)
$(SAT - \overline{SAT})$		-0.105	-0.124
		(0.016)	(0.059)
SAT			0.019
			(0.051)
Constant	-0.338	-0.309	-0.474
	(0.121)	(0.118)	(0.401)
Log likelihood	-4755	-4720	-4720

N=7126

inter-racial relationships with Hispanics and asians.

Table 5: Probit Estimates of the Relationship Between Group Share and the Probability Knowing Two or More Members of the Group Well†

	Know Two or More:	
Variable	Hispanics	Asians
Group Share	28.70	17.43
	(3.96)	(2.72)
(Group Share)^2	-0.122	-0.123
	(0.060)	(0.053)
Female	-0.136	-0.233
	(0.025)	(0.047)
$(SAT - \overline{SAT})$	-0.031	0.079
	(0.013)	(0.020)
Constant	-1.250	-0.658
	(0.044)	(0.087)
Log likelihood	-3021	-3244
Average Group SAT - Average White SAT	-58	56

N=5459

Although including school fixed effects makes it impossible to identify how representation affects interaction, we can see if the coefficient on relative SAT score changes once school fixed effects are included. Results of these specifications are in Table 6. Once again we see that those with high relative SAT scores are more likely to interact with asians and less likely to interact with blacks and Hispanics.

4.3 Further Tests of Homophily and Evidence of Statistical Discrimination

With the evidence suggesting that those with high SAT scores at a particular being less likely to know two or more blacks well, we now attempt to relate this back to the distributions of SAT scores of blacks and non-blacks within the school. In particular, we create three individual-specific peer groups: those with SAT scores 160 points above the individual's own SAT score, 160 point below, and those with SAT scores within plus or minus 160 points. We

Table 6: Probit Estimates of the Relationship Between Group Share and the Probability Knowing Two or More Members of the Group Well with School Fixed Effects†

	Know Two or More:		
Variable	Blacks	Hispanics	Asians
Female	-0.137	-0.151	-0.246
	(0.060)	(0.024)	(0.044)
$(SAT - \overline{SAT})$	-0.105	-0.039	0.078
	(0.015)	(0.012)	(0.021)
Observations	7126	5459	5459
School Fixed Effects	Yes	Yes	Yes

then examine how percent black within these groups affects the probability of knowing two or more blacks well. The shares adjusted for the size of the group such that the initial model is nested: if the coefficients of percent black in the three groups are the same, we will obtain the results from the initial model. Results are displayed in Table 7.

The first column of Table 7 uses the institutional variation used in the previous tables. Similarity in SAT scores seems extremely important to inter-racial interaction. The coefficient on the black share of those of similar SAT scores is four times as large as the black share of those with SAT scores significantly below the individual's score.

The response to share black in the different peer groups, however, is not symmetric. Namely, the coefficient on black share for those with significantly higher SAT scores is actually higher than corresponding coefficient on similar SAT scores. To test whether this difference is statistically significant, the second column of the table restricts the effect of the higher SAT group share to be the same at those with similar SAT scores. We cannot reject the restriction that the coefficients are the same.

That the coefficients are the same for higher SAT score share and similar SAT score share stands in contrast to the significantly smaller effects for the lower SAT score share. This is consistent with the model of statistical discrimination: non-blacks choose to engage with blacks who emit the right signals and these signals are more likely to be admitted from those with higher SAT scores.

The next set of columns expands the number of groups to six. Each of the SAT groups

is split in two, one for within the individual's major and one outside. Again if the coefficient estimates are the same we are back to the restricted model. Although the estimates are much more noisy, the same patterns emerge both within and outside one's major. Regardless of whether it is outside or inside the major, the black share for those with lower SAT scores is much smaller than the corresponding effects through the black shares of higher SAT scores and similar SAT scores.

5 Simulations

The evidence presented in the previous section suggests that homophily may be important in inter-racial interactions. Given the large differences in SAT scores across blacks and whites at the College & Beyond schools and that the relationship between college quality and percent black is positive moving from tier 2 to tier 1 schools, affirmative action may actually have a negative effect on inter-racial interaction. We investigate this possibility here, as well as what the optimal affirmative action policy would be given the goal of maximizing inter-racial contact. Since the differences across majors was small, we focus on simulations where major is ignored. Adding major assignment had no appreciable effects on the results.

To do this, we need to develop assignments rules for the case without affirmative action. We estimate multinomial logit model of college assignment where the probability of being assigned to one of the j schools in the data set is a function of the individual's sex, race, and SAT score. The probability of being assigned to school j is given by:

$$Pr(j|X_i) = \frac{\exp(\beta_{0j} + SEX_i\beta_{1j} + BLACK_i\beta_{2j} + SAT_i\beta_{3j})}{\sum_{j'=1}^{J} \exp(\beta_{0j'} + SEX_i\beta_{1j'} + BLACK_i\beta_{2j'} + SAT_i\beta_{3j'})}$$

To simulate the less aggressive affirmative action policies, we attempt to break the tie between SAT scores of the school and the race of the individual. To do this, we regress the coefficients on the black indicator variables, the β_{2j}'s, on the coefficients on the SAT score, the β_{3j}'s. The R^2 of this regression is above 0.95. The data points as well as the fitted line are displayed in figure 3. The residuals from this fitted line then represent the advantages particular schools have in attracting black students. However, there are not enough schools to be representative of the population of schools in each tier. Hence, all simulations are done using points on this line— purging the school-specific residuals from the black coefficient.

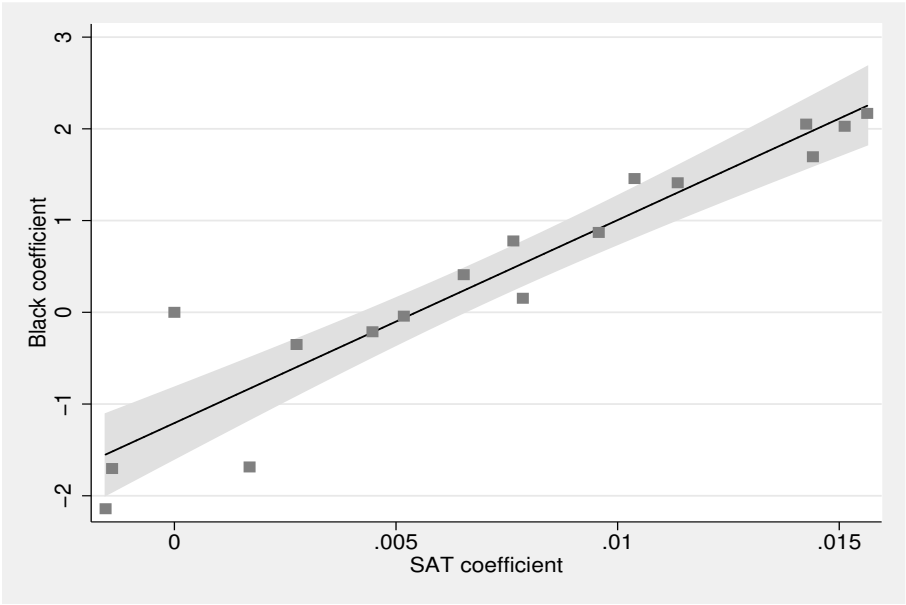
Given the coefficients of this regression, we can simulate affirmative action programs that are less aggressive than those used in the College & Beyond. Note that some individuals who

Table 7: Probit Estimates of the Relationship Between Percent Black Both In and Out of Major and Knowing Two or More Blacks Well Allowing for Variation by SAT Gap†

	Variable	(7)	(8)	(9)	(10)	(11)	(12)
	Higher SAT	17.66	—				
		(6.47)					
Black Share	Similar SAT	14.98	15.41				
Overall		(2.55)	(2.35)				
	Lower SAT	3.65	3.63				
		(1.24)	(1.26)				
	Higher SAT			7.40	—	34.91	—
				(49.17)		(51.95)	
Black Share	Similar SAT			26.66	23.8	37.82	36.57
in Major				(15.08)	(11.80)	(18.13)	(13.60)
	Lower SAT			1.91	1.91	-1.95	-1.81
				(6.69)	(6.57)	(7.38)	(7.31)
	Higher SAT			19.56	—	15.46	—
Black Share				(9.60)		(9.23)	
Outside Major	Similar SAT			13.96	14.62	12.09	12.66
				(2.71)	(2.49)	(2.78)	(2.50)
	Lower SAT			4.01	3.93	4.43	4.37
				(1.57)	(1.54)	(1.70)	(1.67)
	Share Black^2	-0.314	-0.315	-0.316	-0.315	-0.335	-0.336
		(0.032)	(0.032)	(0.031)	(0.031)	(0.035)	(0.035)
	Female	-0.141	-0.140	-0.138	-0.138	-0.161	-0.161
		(0.031)	(0.031)	(0.031)	(0.031)	(0.032)	(0.032)
	Constant	-0.090	-0.093	-0.100	-0.100	-0.220	-0.222
		(0.064)	(0.064)	(0.065)	(0.064)	(0.101)	(0.100)
	Major Fixed Effects	No	No	No	No	Yes	Yes
	Log likelihood	4729.9	4730.0	4729.6	4729.7	4716.9	4717.0

N=7126

Figure 3: †

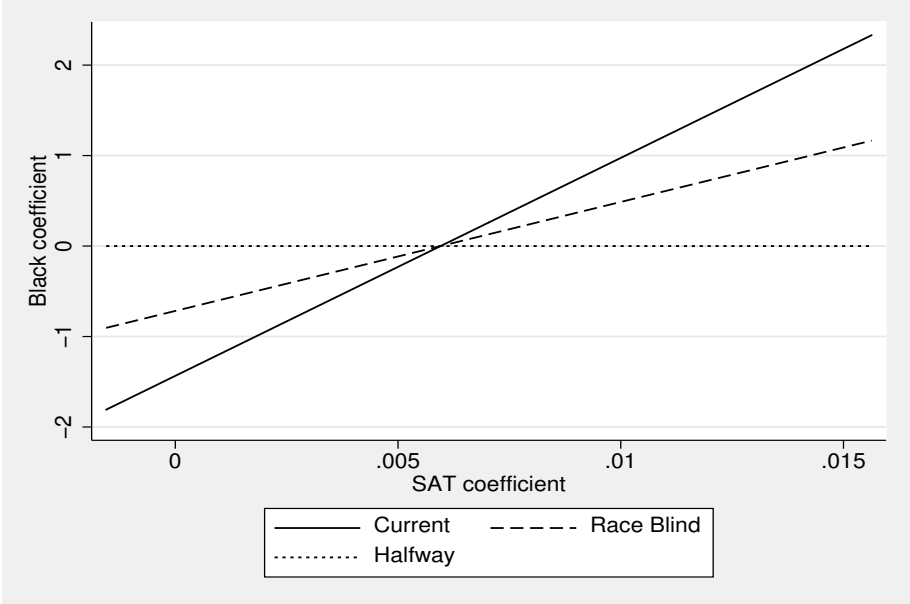


are in the College & Beyond data set would not have been able to attend any of those schools without affirmative action. Hence, in our simulations we pull out the bottom of the black SAT distribution with different definition of 'bottom' (e.g. bottom 10%, 20%, etc.). We cannot simulate more aggressive affirmative action policies as we would then need to add individuals to the data set. Note that individuals who are dropped would likely attend colleges not in the College & Beyond data. Hence, any improvements in inter-racial contact would likely be magnified through the increased inter-racial contact at lower tiered schools. Further, the less aggressive the affirmative action policy, the less scope there is for statistical discrimination. If affirmative action were removed, we would expect the difference between the effects of percent black above one's own SAT score and percent black below one's own SAT score to dissipate. These factors suggest that any improvements we find are actually lower bounds on the increases in inter-racial contact due to the weakening of affirmative action policies.

Figure 4 displays how the coefficients can be adjusted to either remove or weaken affirmative action. The steepest line represents current affirmative action policies. The flat line adjusts the black coefficients such that there is no relationship between the black coefficients and the coefficients on SAT score. Less aggressive policies than those in the data set can then be simulated by flattening—but not removing the positive slope—of the line.

We first consider whether we could reassign students and improve the probability of interaction. These results are displayed in Table 8. Assigning blacks according to the white

Figure 4: College Percent Black as a Function of Average SAT Score†



rules would actually yield a small increase in the probability of knowing two of more whites well. The slope of the black-SAT coefficient line that maximizes inter-racial contact is 30% of the actual slope. Hence, conditional on constant enrollment, inter-racial contact would be maximized with substantially weaker affirmative action policies than those that are currently in place.

The small changes at the aggregate level, however, are masking much larger changes across the tiers of institutions. Namely, top tier schools see large drops in interaction rates as affirmative action weakened with corresponding larger increases in interaction rates at tier 3 schools.

Note, however, that the weakening removal of affirmative action, while having little effect on the enrollment at all institutions, would decrease the enrollment of black students at these particular institutions. Table 9 shows the increases or decreases in inter-racial contact from assigning blacks to schools using the white rules while cutting out the bottom 10, 20, 30 and 40% respectively of the black SAT distribution. Small increases in inter-racial interaction occur when affirmative action is removed as long as no more than the bottom 20% of the black SAT distribution is removed. However, these small increases are masking much larger changes across the college tiers. The removal of affirmative action would lead to large increases in interaction at tier 3 schools at the expense of smaller drops in interaction at tier 1 schools.

At issue, then, is how much of the black distribution would be cut if affirmative action were

Table 8: Optimal Assignment Rules

	Overall	Tier 1	Tier2	Tier3
Interaction under current policy	59.99%	65.15%	60.15%	57.38%
Decrease or Increase in Contact:				
10% weaker	0.73%	-1.29%	0.45%	2.07%
20% weaker	1.40%	-2.75%	0.75%	4.13%
30% weaker	1.93%	-4.37%	0.91%	6.12%
40% weaker	2.37%	-6.16%	0.93%	8.05%
50% weaker	2.67%	-8.04%	0.80%	9.86%
60% weaker	2.83%	-10.04%	0.48%	11.55%
70% weaker	2.87%	-12.08%	0.02%	13.11%
80% weaker	2.80%	-14.14%	-0.62%	14.50%
90% weaker	2.60%	-16.18%	-1.41%	15.72%
Race-blind	2.28%	-18.16%	-2.34%	16.78%

Note: Tiers 1, 2, and 3 have average SAT scores above 1300, between 1200 and 1300, and below 1200 respectively.

Table 9: Simulations of Knowing Two or More Under-represented Blacks Well Under Different Affirmative Action Policies Without Differential Major Effects

	Overall	Tier 1	Tier 2	Tier 3
Reallocating Blacks according to White Rules	2.28%	-18.16%	-2.34%	16.78%
Dropping Bottom 10% of Blacks ranked by SAT Score	1.58%	-18.17%	-2.51%	15.30%
Dropping Bottom 20% of Blacks ranked by SAT Score	0.40%	-18.19%	-2.84%	12.90%
Dropping Bottom 30% of Blacks ranked by SAT Score	-0.01%	-18.25%	-3.36%	9.69%
Dropping Bottom 40% of Blacks ranked by SAT Score	-0.03%	-18.30%	-3.94%	5.45%

Note: Tiers 1, 2, and 3 have average SAT scores above 1300, between 1200 and 1300, and below 1200 respectively.

Table 10: Average SAT Scores by Race and College Tier

	Tier 1	Tier 2	Tier 3
Whites	1349	1259	1143
Blacks under Affirmative Action	1208	1108	973
Reallocating Blacks according to White Rules	1251	1152	998
Dropping Bottom 10% of Blacks ranked by SAT Score	1252	1162	1052
Dropping Bottom 20% of Blacks ranked by SAT Score	1255	1176	1095
Dropping Bottom 30% of Blacks ranked by SAT Score	1258	1190	1128
Dropping Bottom 40% of Blacks ranked by SAT Score	1265	1208	1161

Note: Tiers 1, 2, and 3 have average SAT scores above 1300, between 1200 and 1300, and below 1200 respectively.

removed. Table 10 gives the average SAT scores for blacks under the assumptions regarding how much of the black distribution to drop. Note that even if the removal of affirmative action blacks will have lower SAT scores than whites at the very best schools. This is because the black SAT distribution is shifted to the left relative to the white SAT distribution and black students are therefore more likely to be at the lower end within a school. Dropping the bottom 40% is then clearly too much as the SAT scores of blacks at tier 3 schools would be higher than their white counterparts. Dropping the bottom 30% would involve differences between average white and average black SAT scores of 90 and 73 points at tier 1 and tier 2 schools respectively. These gaps too seem substantially large when compared to the forecasted 14 point gap at tier 3 schools. This suggests that the simulations where the bottom 20% or less are dropped are most realistic. In the case of the bottom 20%, removing affirmative action is essentially a wash on inter-racial contact, though this ignores the downward bias associated with not including the increased interaction at lower tiered schools and the mitigation of statistical discrimination.

6 Conclusion

In this paper we have shown that the probability of interaction between races is sensitive to the degree of mismatch between racial groups, as measured by SAT scores. Because affirmative

action serves to create such a mismatch, population levels of inter-racial interaction may suffer. Our simulations show that weaker affirmative action policies may lead to more inter-racial interaction. Top tier schools would see losses in inter-racial interaction that are more than made up for by the increases in interaction at lower-tiered schools.

The legal arguments used to justify the continued use of race as a factor in college admissions are thus right in a sense: increases in representation do lead to increases in inter-racial interaction. However, interaction at one university precludes interaction at another university. Our results suggest that college administrators and admissions officers need to think more carefully about the mechanisms by which to ensure that such interaction takes place. Policies that admit less qualified minority applicants to elite institutions instigate a cascading effect that, by introducing a mismatch in the backgrounds of majority and minority students system-wide, most likely reduces the population rate of inter-racial interaction on college campuses. While this mismatch is unlikely to yield poor outcomes along traditional lines (Rothstein and Yoon 2006), it may hamper inter-racial contact. Other policies designed to foster an environment of interaction by diverse peers on campus, such as random housing assignments (Duncan et al. 2003), may be more promising tools to generate inter-racial dialogue.

Appendix

Figure 5: College Percent Black as a Function of Average SAT Score, Not Weighted†

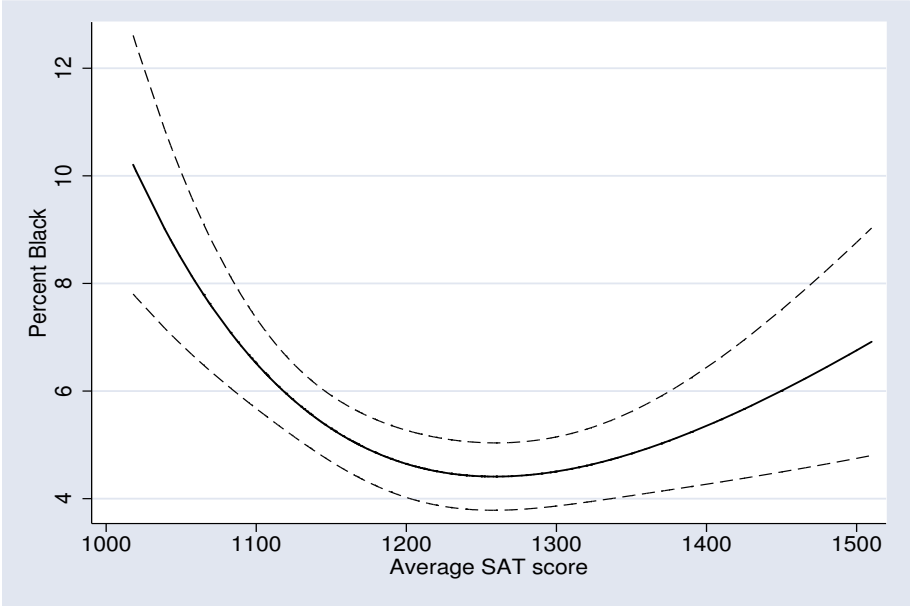
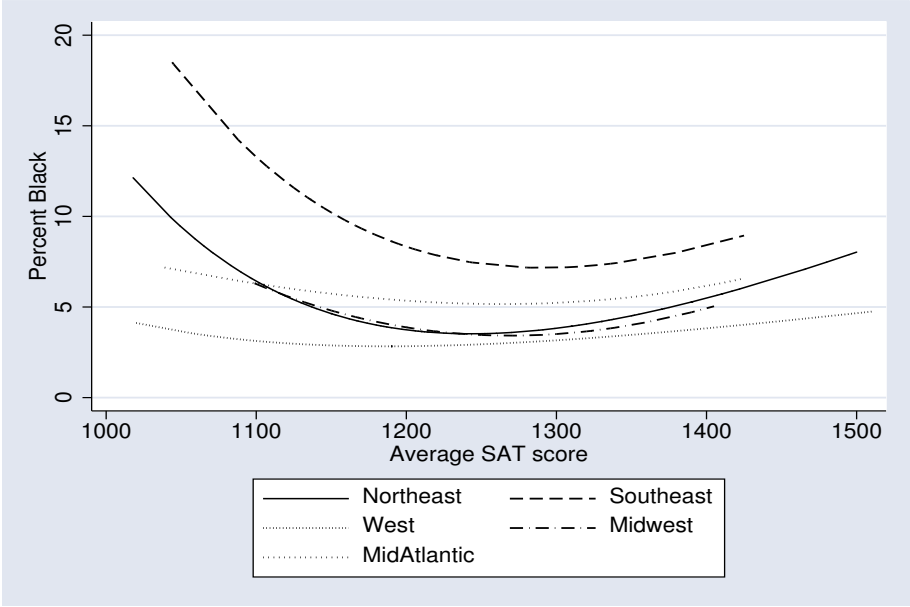


Figure 6: College Percent Black as a Function of Average SAT Score by Region, Not Weighted†



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