

Affirmative Action Bans and the “Chilling Effect”

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June 2012

This paper examines whether California’s Proposition 209, which led to the 1998 ban on the use of racial preferences in admissions at the University of California (UC) system, lowered the value that underrepresented minorities placed on attending UC schools. In particular, we look for evidence of a chilling effect in minority yield rates (the probability of enrolling in a UC school conditional on being accepted) after Prop 209. Using individual-level data on every freshman applicant to the UC system from 1995 to 2000, we find no evidence that yield rates fell for minorities relative to other students after Prop 209, even after controlling for changes in student characteristics and changes in the set of UC schools to which students were admitted. In fact, our analysis suggests Prop 209 had a modest “warming effect”. We investigate and rule out the possibility that this warming effect was driven by changes in the selection of students who applied to the UC, changes in financial aid or changes in minorities’ college opportunities outside the UC system. Instead, we present evidence consistent with the idea that Prop 209 increased the signaling value of attending UC schools for minorities.

I. Introduction

Starting with the entering class of 1998, the University of California system formally ended the use of racial preferences in undergraduate admissions. Although the origins of this policy are complex, its proximate cause was the 1996 passage of Proposition 209 (Prop 209), which prohibited public institutions from giving preferential treatment on the basis of race, sex or ethnicity. In the mid-1990s, when Californians debated this ban on the use of racial

¹ We thank the participants in the 2010 Southern California Conference for Applied Microeconomics, Mae Brown, and Kate Brenner for their helpful comments and input, Flori So and Ling Shao for their research assistance, and the University of California Office of the President, Jane Yakowitz, David Card and the College Board for helping us obtain the various data sets used in this paper. We are also grateful to the Searle Freedom Trust and Project Seaphe for financial support.

preferences at the University of California, one of the most fiercely contested questions concerned the “chilling effect” of the bans. Almost everyone agreed that a preference ban would directly reduce the proportion of underrepresented minorities (URMs) admitted to the UC system, especially at the more elite campuses like Berkeley and UCLA, but for many the more pressing question was whether the bans would cause fewer URMs to apply to UC schools, and fewer to accept offers extended, because of perceptions that the bans would change the college campuses in ways that would make them less attractive to URMs.² The answer to this question was crucial, because even the most ardent opponent of racial preferences would presumably take pause if a ban would lead qualified minority applicants to eschew the affected schools.

The question of whether chilling effects follow an affirmative action ban remains largely unanswered, even though nearly fifteen years have passed since Prop 209, and even though similar bans have spread to many other states (over a fifth of college-age Americans now live in states whose public universities are covered by some type of ban on the use of racial preferences). A significant barrier to research has been the absence of data on individuals who apply to and enroll in affected universities.

In this paper, we use a new dataset from the University of California to assess whether the value URMs placed on attending the UC system fell (was chilled) by Prop 209. To do so, we focus on how yield rates (the probability of enrolling conditional on being admitted) changed for URMs relative to non-URMs between the three-year period before (1995-1997) and after (1998-2000) the formal elimination of racial preferences. An advantage of using yield rates over application rates to examine chilling effects is that application rates reflect not only the value students place on attending a given school but also their perceived chances of being admitted. As a result, it’s difficult to determine whether any difference in application rates before and after

² In the UC system, URMs include African Americans, Mexican Americans, Latinos and Native Americans.

Prop 209 was due to a change in URMs' probability of admission or a change in the value URMs placed on attending UC schools.

Our dataset contains information on all freshman applicants and enrollees to all eight undergraduate UC campuses from 1995 through 2000. To our knowledge, our study is the first to use detailed individual-level data to look for direct evidence that bans on the use of racial preferences lead to chilling effects in yield rates.³ These individual-level data allow us to control for differences in the composition of the applicant pool before and after Prop 209. In addition, because our data reveal every UC-school to which students were accepted, we can examine enrollment decisions controlling for changes in students' choice sets within the UC-system. This is crucial because if Proposition 209 changed the size and quality of UC schools to which URMs were admitted, then that alone is likely to affect enrollment decisions, even if there is no change in the intrinsic value URMs place on UC-schools

Unexpectedly, we find evidence of a modest *increase* in the yield rate of URMs relative to non-URMs after Prop 209. At Berkeley, for example, URMs' yield rate increased by 5.7 percentage points (approximately 15 percent) relative to non-URMs after Prop 209. This increase is particularly striking given that it occurs on top of a modest general increase in the yield rate of all students after Prop 209. Neither changes in the selection of students who applied to the UC, nor changes in financial aid, nor changes in URMs' college opportunities outside the UC appear to account for this warming effect. In addition, while we cannot rule out the possibility that increased recruiting accounts for some of the warming effect we observe, we also present evidence that Prop 209 may have increased the signaling value of attending a UC school.

³ See our discussion of Wilbur (2010), Barrios (2006) and Tienda (2003) in Section III.

Our paper proceeds as follows. Section II presents some background on Proposition 209 and clarifies our definition of chilling effect. Section III discusses the related literature, and in Section IV, we present our basic empirical strategy. Sections V and VI discuss our data and highlight our main findings. Then in Section VII, we explore a number of possible explanations for our results, including the possibility that Prop 209 changed the signaling value of attending a UC school for URMs. Section VIII concludes.

II. Background and Definitions

The Effect of Prop 209 on the Admissions Process

It is well established that URMs' chances of being admitted to the UC fell dramatically in 1998 and that this drop was especially large at the most selective UC campuses. At Berkeley, for example, between 1995 and 1997, approximately 52 percent of URMs who applied for admission as freshman were accepted, but this number fell to just 25 percent between 1998 and 2000.⁴ Given that 1998 was the first year in which race could no longer be used as an explicit criterion in admissions, it is widely accepted that that these changes were the result of Prop 209.

Although Prop 209 prohibited UC schools from using race as an explicit criterion in admission, it did not prevent them from changing their admissions process in ways that might continue to promote racial diversity (for example, by giving a preference to students from single-parent families, a large fraction of whom are either Hispanic or African-American). In fact, the UC system and individual campuses have made changes to the admissions process to accomplish exactly this. Changes to the admission process, however, take time to implement, and it is not clear how much (if at all) the overall admissions process at the different campuses changed in the

⁴ Table 1 details the change in the probability of admission at each UC campus after Prop 209.

few years immediately following Prop 209. At UCSD, for example, other than the fact that URMs were held to the same admissions threshold as non-URMs after Prop 209, there was no change from 1998-2000 in the way in which points were allocated to the various dimensions of a student's record. In 2001, however, partly as a way to increase racial diversity, the UC system introduced a number of widespread changes to the admissions process, including what was termed "eligibility in a local context", whereby students in the top four percent of their high school class were guaranteed admission to a UC school as long as they completed specified academic coursework by the end of their junior year. Partly for this reason, our "post" Prop 209 analyzes the admissions cycles of 1998-2000.

Defining Chilling Effects

In the politically charged debate over affirmative action, nearly all terms – including "affirmative action" itself – have contested meanings. "Chilling effect" has been used to describe the "chilling" of affirmative action itself, or the pall a ban on racial preferences might cast over race relations generally, or the "silencing" effect a ban on racial preferences could have on minority classroom participation. It is most commonly used, however, to describe the loss of interest minorities might have in attending institutions that do not demonstrate a commitment to diversity through the use of racial preferences. In this paper, we try to determine whether Prop 209 led to this type of chilling effect by examining whether there was a fall in the likelihood that URMs relative to non-URMs accepted offers of admission to UC campuses after Prop 209.

The value students place on attending a given college or university may be a function of many factors including academic quality, campus life, cost and expected future labor market opportunities, and Prop 209 undoubtedly had some effect on all of these factors. Nonetheless,

there are two primary ways that chilling effects, as we have defined them, are thought to operate. First, an affirmative action ban might be taken to connote institutional hostility to URM. If the University of California has renounced policies of inclusion that most universities embrace, does this cause it to stand out as an institution with a markedly less favorable attitude towards minorities? Second, a ban on preferences would reduce minority enrollments, at least on some campuses, and on those campuses entering minority students would be part of smaller URM cohorts. This could make prospective students more concerned about isolation on campus, the absence of peer groups, and the absence of the “critical mass” of URM often invoked by affirmative action proponents as a key rationale for preferences.

As an empirical matter, both stories are a little complicated in the UC context. At the institutional level, UC administrators went to considerable lengths to avow their opposition to Prop 209 and to emphasize the university’s commitment to diversity. Several campuses launched outreach programs aimed, in part, at reassuring minority applicants that they were still very much sought after by the university. On the other hand, UC was more directly implicated in the preferences ban than were the state university systems of Florida, Michigan and Washington, where similar bans were introduced, because the UC Regents had adopted resolutions committing the university to an eventual ban on racial classifications in 1995, more than a year before Prop 209 passed.⁵

The critical mass story is complex too. While black and Hispanic enrollments fell at the more elite UC campuses after Prop 209, minority enrollments increased at other campuses. It is hard to assess how prospective freshmen expected the racial composition of the different UC campuses to change after Prop 209, but we might at least expect any chilling effect to have

⁵ The implementation of these resolutions was deferred to observe the outcome of Prop 209.

varied from one campus to another. Partly for this reason, our analysis separately examines each individual campus as well as the UC system as a whole.

As we have noted, arguments for chilling effects played a prominent role in the debate over Prop 209. The idea that Prop 209 could have had an opposite “warming effect” was never advanced in the public debate, to our knowledge. According to standard signaling models, however, students attend elite schools partly as a way of signaling to future employers their underlying motivation and ability, and a university’s use of racial preferences could muddy or decrease the value of this signal, if employers assume that URM students were offered admission as much because of their race as because of their academic credentials. For related reasons, URM students may feel more comfortable and be more successful at a school if, *ceteris paribus*, their professors and fellow students know that they were admitted solely on the basis of academic credentials.⁶ A black candidate deciding between Berkeley and Stanford, for example, might conclude after Prop 209 that the signaling value of a degree from Berkeley, where there is little or no suspicion of racial preferences in admission, is greater than the signaling value of a degree from Stanford, where the suspicion of racial preferences in admissions is substantially higher. Thus, while the policy debate has focused on the chilling effects of affirmative action bans, warming effects are plausible as well.

The Big Picture

Since many of the results we present later in the paper are embedded in detailed models, a brief overview of application, admission, and enrollment trends at the University of California before and after Prop 209 may help orient the reader. Figures 1, 2, and 3 show how applications,

⁶ Card and Krueger (2005) also mention this possibility.

admissions and enrollments for URMs relative to non-URMs evolved from 1994, a year before the first step towards race-neutral admissions (the Regent's adoption of SP-1), until 2008, a decade after the implementation of the ban on racial preferences.⁷ The figures show UC-wide patterns, as well as those at the most elite UC campus (Berkeley) and the least elite UC campus (Riverside).

Broadly speaking, three trends underlie these figures. First, after Prop 209, URMs shifted applications from more selective to less selective UC campuses (Figure 1), apparently as a rational response to the massive decline in URMs' relative chances of admission to the most selective UC campuses (Figure 2). Second, while URM enrollment shares fell at the most selective UCs after Prop 209, they rose at the less selective UCs, and URM enrollment shares for the UC system as a whole were remarkably stable during this time period (Figure 3). Below we suggest that the stability of URM enrollment shares was aided by the warming effect. Third, the reader should keep in mind that white and Asian applications to the UC system (especially the most elite campuses) surged after Prop 209; the number of non-URM applicants to Berkeley and UCLA, for example, rose 27 percent from 1995-97 to 1998-2000. Plausibly, non-URMs believed that Prop 209 increased their admission chances at elite UC schools. This means that the URM shares shown in Figures 1, 2, and 3 occur in a context where students generally were attracted to apply to UC schools in significantly greater numbers after Prop 209.

Unfortunately, while interesting, it is difficult to draw conclusions about chilling and warming effects from the trends in Figures 1-3. The fall in URMs' enrollment share at Berkeley, for example, is largely a direct result of the fact that fewer URMs were admitted after Prop 209. Similarly, the changes URMs' application patterns may simply reflect the changes in URMs'

⁷ These figures were generated with data from UC's StatFinder webpage: <http://statfinder.ucop.edu/>.

perceived likelihood of admission to the different campuses rather than a change in the value URMs placed on attending UC schools. For these reasons, in this paper, we focus on the changes in the rate at which URMs relative to non-URMs enrolled in UC schools conditional on having been admitted.

III. Past Research

We know of no past research that has cleanly tested how bans on the use of racial preferences in college admissions affect minority yield rates. A brief tour of the most closely-related past work helps to highlight the characteristics that make our analysis unique.

Several authors have been specifically interested in the chilling effect, but have not analyzed it robustly for a variety of reasons: writing before the results of such bans could be observed (Orfield and Miller, 1998); using aggregate-level data that does not allow the modeling of individual student choices (Barrios, 2006); or examining admission and yield behavior after, but not before, the implementation of a racial preference ban (Wilbur, 2010). Tienda et al (2003) conducted an analysis with some similarities to our own, examining yield rates of blacks and Hispanics at the University of Texas in the years after a Fifth Circuit court decision banned the use of racial preferences at public universities in Texas. However, their findings (generally showing declining yield rates for Hispanics and blacks) are muddled by the introduction of a “top 10 percent plan” in Texas (which guaranteed admission to all Texas students whose grades placed them in the top tenth of their high school class) almost immediately after the racial preferences ban went into effect. Tienda et al’s analysis is thus a comparison of two different admissions systems, rather than an analysis of a simple removal of racial preferences.

Backes (2011) and Hinrichs (2011) have examined the effect of several statewide racial preference bans upon URM enrollment shares at public universities. Both find evidence that

these bans reduced URM enrollment shares at highly selective schools and increased enrollment shares at moderately selective schools, with little or no change in aggregate URM enrollment. These studies, however, say little about chilling effects since enrollment shares are affected by students' chances of being admitted. For this reason, we focus on how Prop 209 affected the probability that students enroll conditional on being admitted.

Long (2004), Card and Krueger (2005) and Antonovics and Backes (2011) examine the effect of bans on the use of racial preferences in college admissions on application behavior. All three of these studies – particularly the last two – find remarkable stability in the number of minority applicants after bans. This stability suggests an absence of chilling effects at the application stage, and heightens the importance of examining enrollment decisions among admitted students.

IV. Empirical Strategy

To assess whether Prop 209 increased or decreased the value URM students placed on attending UC schools, our analysis focuses on changes in yield rates for URM students relative to non-URMs after Prop 209. There are, however, a number of ways in which Prop 209 may have affected minority enrollments for reasons unrelated to chilling (or warming) effects. In this section, we identify these complicating factors and explain how we account for them with our empirical strategy.

First, the likelihood of accepting an offer of admission from any particular UC campus depends on what other offers a student receives. A student admitted to UCLA, for example, is far more likely to accept the offer if she has been turned down by Berkeley. Since URM students' probability of admission (particularly at the more elite campuses) fell after Prop 209, it is important to control for changes in each applicant's UC choice set. Fortunately, our data allow us

to do so, and in our empirical specification, we include indicator variables for whether a student was admitted to each of the UC schools.

Yield rates at particular schools also vary with the academic strength of the admitted student. As we demonstrate below, students with relatively high credentials generally have lower yield rates, presumably because they have a wider set of attractive alternatives. Thus, since Prop 209 led to a higher average level of academic credentials among admitted URMs (the improvement is particularly noticeable at the more elite campuses), we would expect, all else equal, the yield rates of URMs to be lower after Prop 209. Here again, the richness of our data enables us to control for changes in student characteristics.

With this in mind, we estimate the following equation using OLS:

$$(1) Y_{ij} = \beta_0 + \beta_1 URM_i + \beta_2 post_i + \beta_3 URM_i * post_i + \gamma X_i + \delta A_{ij} + u_{ij},$$

where Y_{ij} is an indicator for whether student i enrolled in school j conditional on being accepted to school j , URM_i is an indicator for whether student i is an underrepresented minority, $post_i$ is an indicator for whether the student was making their enrollment decision before or after Prop 209 went into effect, X_i is a vector of student and family background characteristics, and A_{ij} is a vector of indicator variables describing the set of other UC schools to which student i was admitted.⁸ The parameter of interest is β_3 , which captures the change in the yield rate of URMs before and after Prop 209 relative to the change in the yield rate of non-URMs. We conduct this analysis separately for each of the eight schools in the UC system and for the UC system as a whole.

Note that we do not estimate a multinomial choice model of students' enrollment decisions in which students choose to enroll in one of the schools to which they are admitted.

⁸ A possible concern with this specification is that the set of schools to which a person is admitted is at least partly a choice variable—a student cannot be admitted to a school unless they apply. As mentioned above and as we discuss further below, Prop 209 appears to have had very little effect on URMs' application behavior.

While this estimation strategy would yield efficiency gains (because unobservable factors that influence students' enrollment decision at one school may be informative about their decision to enroll in other schools), estimating this type of model is complicated by the fact that not all students face the same choice set. With 8 UC campuses, there are 255 possible combinations of schools to which students can be admitted (including the possibility that a student is admitted to no UC school). This implies that as many as 255 separate discrete choice models would need to be simultaneously estimated. Doing so would be computationally burdensome with a probit model, and the implied independence of irrelevant alternatives (IIA) assumption for logit models would almost certainly be violated in our setting (eliminating Berkeley from a student's choice set, for example, would be likely to affect their probability of enrolling in UCLA). The IIA problem could be mitigated by grouping schools into a smaller number of tiers, but it is not obvious how these groupings should be constructed or whether they would satisfy the IIA assumption. For these reasons, we prefer the simple specification presented in equation (1).

This strategy yields unbiased estimates of the conditional mean difference in the likelihood that URMs versus non-URMs enroll in a given school before, relative to after, Prop 209. Since each student faces a single decision of where to enroll, it is important to note that the estimates generated for each of the UC campuses should not be viewed as independent of one another.

V. Data

To examine the effect of Prop 209 on enrollment rates, we use administrative data from the University California Office of the President (UCOP) on every Fall freshman applicant to the UC system from 1995-2000.⁹ The dataset includes information on all of the nearly 360,000

⁹ These data are available from the authors upon request.

applicants during this time period, including each person's application characteristics (academic achievement, family background), each campus applied to, the outcome of each application, the campus (if any) the applicant eventually enrolled in, the student's intended and eventual major, the student's academic performance in college and his or her eventual graduation outcomes.

To protect student confidentiality, UCOP condensed race into four categories: URM, White, Asian, and Other/Unknown. The category "URM" includes American Indians, Blacks, Chicanos and Latinos. This is a sensible grouping since these are the races and ethnicities that received preferential admission consideration before Prop 209. The category "White" includes non-Hispanic whites; "Asian" includes students who identify as Asian, Indian/Pakistani or Filipino. Finally, the "Other/Unknown" category includes both students who indicate their race is "Other" and students who chose not to reveal their race ("Unknown").

Another change to the original UCOP data was the consolidation of matriculation years into three-year cohorts. Thus, we only know whether a student applied either from 1995 to 1997 or from 1998 to 2000. Fortunately, since Prop 209 went into effect beginning with the Fall 1998 cohort, we can cleanly compare the three years before Prop 209 (1995-1997) with the three years after implementation (1998-2000).

The Data Appendix discusses a number of other features of the data, including (a) the observed increase in the proportion of students not reporting any race after Prop 209; and (b) the significant proportion of missing values for one variable, family income.

VI. Changes in the Characteristics of Applicants and Admitted Students

Before presenting our results, it is worth investigating the extent to which there were changes in the observable characteristics of URM applicants and admittees after Prop 209. If so,

it raises concern that our results may be biased by changes in unobservable student characteristics that cannot be controlled for using our data.

Table 1 shows the average characteristics of URM and non-URM applicants both before and after Prop 209, with the final column highlighting the change for URMs relative to non-URMs. As the table shows, there was a very small but statistically significant increase in the relative academic credentials (as measured by math SAT scores and adjusted high school GPA) of URM applicants after Prop 209. This pattern of increasing relative academic credentials holds at each of the eight campuses.¹⁰ That the relative academic ability of URM applicants increased slightly after Prop 209 is not surprising, since the declining use of racial preferences meant that low-credential URMs would be less likely to be admitted (presumably discouraging applicants, and raising the average credentials of applicants). In addition, strong URM students wanting to attend a UC school may have countered their lower likelihood of admission after Prop 209 with additional applications to less elite UC campuses, and this would also tend to raise the average URM credentials at those campuses.¹¹

The post-Prop 209 cohorts show no change in the parental education of URMs relative to non-URMs, and little change in URMs' relative family income. The final rows of Table 1 also show the dramatic effect of Prop 209 on the probability of admission for URMs relative to non-URMs after Prop 209. As mentioned earlier, the fall in the probability of admission was much larger at the more elite campuses.

Whereas Table 1 focuses on students who apply to the UC system, Table 2 shows the average characteristics of students admitted to the UC system. The final column again indicates

¹⁰ A partial exception is that at UCSD the verbal SAT scores of URM applicants fall relative to that of non-URM applicants. Averages for each campus are available upon request.

¹¹ Consistent with this, the campus-level relative increases in URM applicants' academic credentials are somewhat larger than those shown in Table 2, though the magnitude of the differences is small.

a small but statistically significant increase in the academic credentials of admitted URMs relative to admitted non-URMs (as measured by math SAT scores and adjusted high school GPA) after Prop 209. This relative increase in academic credentials is to be expected given that URMs were subject to higher admission standards after Prop 209; accordingly, this relative increase is greatest among students admitted to the more selective UC schools.¹² Paralleling the applicant patterns, there is no change in the relative parental education of admitted URMs, and only small changes in URM's relative family income.¹³

To get a sense of how the changes in the relative characteristics of URMs after Prop 209 may affect our results, Table 3 shows the difference between the academic credentials and family background characteristics of those who do and do not enroll in the UC conditional on being admitted to at least one UC school. As the table shows, students with stronger academic credentials and who are from wealthier and more educated families are less likely to enroll in the UC system, though the magnitudes are quite small. This relationship also holds at the individual campuses we examine. To give a sense of the magnitude of the campus-level numbers, Table 3 also presents the difference between the characteristics of those who did and did not enroll at UC Berkeley and UC Riverside, conditional on being accepted to those schools.¹⁴ For example, we find that among students who were admitted to Berkeley, those who enrolled had SAT verbal scores that were almost 26 points lower than those who did not enroll. Thus, a direct implication of Table 3 is that students with strong academic credentials are less likely to accept offers of admission. Given that URMs admitted to the UC became relatively stronger academically after Prop 209, this suggests that any increase in the enrollment rate of URMs relative to whites will

¹² Averages for each campus are available from the authors upon request.

¹³ The average characteristics of students who enroll in the UC before and after Prop 209 are very similar to the average characteristics of students who are admitted to the UC, except students who enroll tend to have very slightly lower academic credentials and come from poorer families than those who apply.

¹⁴ The complete set of campus-level averages is available from the authors upon request.

become larger once we control for student characteristics (and indeed, we find that they do). As we discuss in Section VIII, it also suggests that to the extent we are missing information on academic credentials (for example, the quality of students' essays) we are likely to understate the true warming effect.

VII. Results

As a first cut at understanding how yield rates changed over time, Table 4 shows yield rates for each racial group in our data before and after Prop 209 took effect. The individual campuses are listed in order of the average math SAT score of admitted students, so that the campuses become less selective as you move from left to right. Focusing on Panel C, which shows the changes in yield rates by racial group, we see that yield rates for URMs increased at each of the eight campuses, but decreased for the UC system as a whole. This apparent paradox is easily explained. If URMs are admitted to a smaller number of UC schools after Prop 209, they may be less likely to attend any UC school, but more likely to attend each school to which they are accepted. For non-URMs, yield rates also tended to go up after Prop 209, but this increase was concentrated at the more selective UC schools. The bottom row of Table 4 presents the difference in the change in yield rates between URMs and non-URMs. Relative to non-URMs, we see that yield rates for URMs dropped for the UC system and for Tier 1 schools, but increased at each of the eight campuses. The relative increase in URM yield rates at the most selective UC campuses is particularly striking in light of the fact that non-URM yield rates also increased at those schools after Prop 209.

To get a sense of the year-by-year changes in yield rates and to make sure that the increase in the relative yield rate of URMs after Prop 209 is not simply part of a long-term trend

of increasing URM yield rates, we examine annual aggregate-level data from the UC's StatFinder web page.¹⁵ Figure 4 plots the difference between the URM and non-URM yield rate as a fraction of the non-URM yield rate for each of the eight UC campuses we study. As Figure 4 shows, there is no evidence that the relative yield rate of URMs was increasing prior to Prop 209.¹⁶

Figure 4 also addresses an additional concern: whether 1998-2000 is the appropriate post treatment period. Although Prop 209 first took effect for the Fall freshman class of 1998, it was approved by voters in November 1996. In addition, even before Prop 209, the UC Board of Regents committed to the eventual end of racial preferences in July 1995 (though the implementation of this resolution was delayed while Prop 209 was debated in court). Thus, we might expect to see changes in the enrollment rate of URMs relative to non-URMs as far back as 1996.¹⁷ As Figure 4 highlights, however, there is no broad pattern of changing relative URM enrollment rates prior to 1998; by far the most striking feature of Figure 4 is the sharp relative increase in URM enrollment rates in 1998, the year Prop 209 went into effect.

Although the broad patterns in Table 4 and Figure 4 are suggestive, drawing definitive conclusions about chilling effects from these aggregate numbers would be overhasty. On one hand, the relative academic credentials of URMs went up after Prop 209, and since strong academic credentials are negatively associated with yield rates, the warming effect found in Table 4 may be even larger once we control for academic credentials. On the other hand, part of

¹⁵ <http://statfinder.ucop.edu/>

¹⁶ Because our data are grouped in three-year intervals, we are unable to directly control for time trends in our main analysis.

¹⁷ The UC's July 1995 resolution to end the use of racial preferences is unlikely to have affected enrollment choices for the Fall freshman class of 1995 since students interested in attending the UC are required to make their enrollment decisions in May.

the increase in yield rates may be due to the fact that URMs are admitted to a smaller number of UC schools and so were more likely to enroll in the schools to which they were admitted.

To control for these factors, Table 5 presents the coefficient estimates on the interaction between *URM* and *post* from Equation (1).¹⁸ We conduct a separate analysis for the UC system as a whole, Tier 1 schools (UC Los Angeles and Berkeley) and each of the eight UC campuses: UC Berkeley, UC Los Angeles, UC San Diego, UC Davis, UC Irvine, UC Santa Barbara, UC Santa Cruz and UC Riverside.¹⁹

The first column presents the simple difference-in-difference estimates without any controls for academic achievement, family background or the set of other UC schools to which students were admitted. Like the last row of Table 4, Column (1) of Table 5 indicates a statistically significant drop in yield rates for URMs relative to non-URMs after Prop 209 for the UC system, but a statistically significant relative increase in yield rates at all of the UC campuses except Berkeley.²⁰

In column (2), we add controls for SAT scores, high school GPA, parental income and parental education. At each of the eight campuses, the addition of these controls tends to increase the coefficient estimate on the interaction between *post* and *URM*. This is to be expected since, the academic credentials of admitted students increased for URMs relative to non-URMs after Prop 209, and as we saw in Table 3, among admitted students, those with higher academic credentials are less likely to enroll in the UC.

¹⁸ We note that the fact that our data only allow us to consider a single pre-period and a single post-period alleviates concerns about serial correlation, and our standard errors are not sensitive to correcting for heteroskedasticity.

¹⁹ UC-Merced did not begin accepting students until Fall 2005.

²⁰ The numbers in column (1) of Table 5 differ slightly from those on the bottom row of Table 4 because column (1) restricts attention to students with complete data on academic credentials and family background. Column (4) of Table 5 includes all admitted students and exactly matches the last row of Table 4.

In column (3) (our preferred specification and the full estimation of Equation (1)) we also add controls for the set of other UC schools to which students were admitted. For the UC system (row 1), adding indicators for the other schools to which a student was admitted causes the coefficient estimate on the interaction term between *post* and *URM* to go from negative and statistically significant to positive and statistically significant. This marked increase in the coefficient estimates from column (2) to column (3) is not surprising since URMs were admitted to fewer UC schools after Prop 209, and column (3) controls for that important change. The same logic helps explain why the coefficient estimates on the interaction between *post* and *URM* is smaller in magnitude for many of the individual campuses as you move from column (2) to (3). That is, part of the increase in URM enrollment rates after Prop 209 was likely due to the fact that URMs admitted to a given campus had fewer offers of admission from other UC campuses, and column (3) controls for changes in students' choice sets after Prop 209.

Looking down column (3), the results suggest a small, but statistically significant increase in the yield rate for the UC system as a whole and at 6 of the 8 UC campuses (Berkeley, UCLA, UCSD, UCD, UCSD and UCR). For UC Irvine the point estimate is positive, and for UC Santa Barbara the point estimate is negative, but neither is statistically different from zero. This increase in yield rate of URMs relative to non-URMs is particularly striking given that it occurs on top of a modest general increase in the yield rate of students of all races after Prop 209. Although not shown, in Table 5 the coefficient on *post* in column (3) is positive and statistically significant at Berkeley, UCLA, UCSD, UCI and UCSB.²¹

The largest estimated warming effect is at Berkeley, where yield rates for URMs increased by 5.7 percentage points relative to non-URMs. Given that the yield rate for URMs

²¹ For UCD and UCSC the coefficient on *post* is not statistically different from zero, and for UCR it is negative and statistically significant (but still small, 2.4 percentage points). Complete results available upon request.

was 37.9 percent before Prop 209, this implies a 15 percent increase the yield rate for URM students after Prop 209. In terms of magnitude, given that 928 students were admitted to Berkeley in 1998, a 5.7 percentage point increase in the yield rate translates into an additional 56 URM students in the entering class. This is a fairly large number given that there were only 412 URM students who actually did enroll in 1998.

As mentioned above, approximately 14.2 percent of students admitted into the UC system from 1995 to 1997 and 21.8 percent of students admitted from 1998 to 2000 have missing information on various measures of academic achievement and family background. Columns (4)-(6) of Table 5 explore the sensitivity of our analysis to dropping students with missing data. To do so, column (4) repeats the analysis in column (1) but does not include controls for academic achievement and family background. This allows us to include students who have missing data for these variables. By construction, the coefficient estimates on the interaction between *post* and *URM* in column (4) should (and do) equal the numbers presented in the last row of Table 4. More importantly, however, the coefficient estimates in columns (1) and (4) of Table 5 are similar, suggesting that the results are essentially unaffected by dropping observations with missing values or by changes in the composition of our sample over time.

As noted previously, the variable missing most frequently is parental income. Thus, column (6) repeats the analysis in column (3), but excludes controls for parental income and only drops observations with missing data on SAT scores, high school GPA and parental education. This significantly increases our sample sizes, and means that we are generally dropping less than a tenth of all observations. If anything, the estimates in column (6) make the warming effect appear even larger.

VIII. Discussion

Our results consistently show a modest but statistically significant increase in the relative yield rate of URMs after Prop 209. These results are inconsistent with the chilling effect hypothesis, which suggests that the yield rates of URMs should have fallen. In this section, we discuss several possible explanations for our finding that relative URM yield rates increased. In particular, we investigate and rule out the possibility that the warming effect we find was driven by changes in the selection of URMs who applied to the UC, changes in financial aid and changes in minorities' college opportunities outside the UC system. Rather, we present evidence consistent with the idea that Prop 209 may have increased the signaling value of attending a UC school for minorities.

Selection

One possibility is that the observed increase in relative yield rates for URMs is due to selection; if the characteristics of URMs who were admitted to the UC changed in ways that we cannot control for, then this could bias our results.

As discussed above, in terms of academic credentials, URMs admitted to the UC became relatively more qualified after Prop 209 (see Table 2). Interestingly, as we see in Table 3, among admitted students, those with stronger academic credentials are less likely to enroll in UC schools. Thus, to the extent that we are missing relevant information on academic credentials, this will likely bias us towards finding a negative impact of Prop 209 on URM yield rates.

Related to this is the possibility that admissions offices partially responded to Prop 209 by placing a heavier weight on non-academic factors (such as socioeconomic background) in order to promote racial diversity without explicitly using race as a criterion in admission, and

that students admitted using these new criteria were relatively more interested in attending UC schools. As it turns out, UC Irvine provides an informative case study of the effect of increasing the weight placed on non-academic factors on URM's relative yield rates. Anticipating the eventual ban on affirmative action, UC Irvine began placing a higher weight on students' personal profiles (for example, the extent to which students faced personal challenges, possessed cultural awareness, etc.) starting in 1997, a year before Prop 209 took effect. Wilbur and Bonous-Hammarth (1998) present evidence that, as hoped, this change in the admissions process increased the acceptance rate of URM's relative to non-URMs. Interestingly, however, the relative enrollment rate of URM's *fell* at UC Irvine in 1997 (see Figure 4). While it is difficult to draw broad conclusions from one school in one year, it does not appear that increasing the weight placed on students' personal profiles increases URM's yield rates relative to whites.

Another possibility is that the relative increase in URM's yield rate arose because only URM's particularly interested in attending UC schools applied after Prop 209. The apparent stability of URM application rates after the implementation of Prop 209, however, is at odds with this explanation. Card and Krueger (2005), for example, find only a one percentage point decrease in the relative probability that URM's sent their SAT scores to any UC school after Prop 209 (compared to a mean score sending rate of 50.8 percent for blacks and 63.5 percent for Hispanics). Thus, it seems unlikely that there would have been substantial changes in the average characteristics of URM applicants after Prop 209. Indeed, Table 1 shows only a small relative change in URM applicants' background characteristics after Prop 209.

Nonetheless, we can examine whether URM's applicants were more interested in attending the UC after Prop 209 using data from the College Board's Test Takers Database on

the universe of SAT takers in California for the 1995-2000 admission cohorts.²² These data allow us to compare students who sent their SAT scores to UC campuses with those who did not. While these data do not indicate where students applied, they do reveal the set of schools to which students sent their scores. While there is not a perfect correspondence between score-sending behavior and application behavior, Card and Krueger (2005) show that changes over time in score sending roughly mirror changes in application behavior.

The College Board data are useful because they include information on the kind of college students are interested in attending (public, private or religious), where they would like to go to college (close to home, in their home state, in a state bordering their home state, in a far away state, or outside the U.S.), and the size of the college they are thinking about (<2k, 2k-5k, 5k-10k, 10k-15k, 15k-20k, >20k). We use this information to examine whether, relative to the change for non-URMs, URMs who sent scores to UC schools became more interested in attending large, public, in-state colleges (like the schools in the UC system) after Prop 209. In addition, since students can provide multiple answers to the above questions (they are invited to check as many options as apply (including undecided)), we can also use these questions to gauge the breadth of students' college preferences.

Table 6 presents our results. In terms of the kinds of colleges students are interested in attending, the most striking finding in Table 6 is that students' college preferences (regardless of race) are very stable over this time period. In addition, the last two rows of Table 6 show that, relative to non-URMs, URMs who sent their SAT scores to any UC school, sent their scores to fewer UC schools after Prop 209, even though they sent scores to more schools overall.²³ Thus,

²² These data were also used in Card and Krueger (2005).

²³ We acknowledge that the relative decrease in the number of UC schools to which URMs sent their SAT scores may reflect the relative fall in their chances of admission.

we find little evidence that the relative increase in URM enrollment rates was driven by an increase in URM applicants' interest in attending UC schools.²⁴

URMs' Options Outside the UC System

How else might the apparent warming effects found above reflect something other than increased URM interest in attending UC campuses? One possible explanation is that if Prop 209 negatively affected URMs' college opportunities outside the UC system, the warming effect might, in part, be caused by URMs having fewer alternatives.

In principle, both the California State University (CSU) system and the California Community College (CCC) system were bound by the provisions of Prop 209. California Community Colleges, however, are required by law to admit any Californian with a high school diploma or who is over 18 and might benefit from instruction. Thus, Prop 209 had no direct effect on URMs chances of admission to CCCs.

The CSU system was also largely unaffected by Prop 209; at the time Prop 209 was passed, only 2 of the 22 CSU campuses (Cal Poly (San Luis Obispo) and Sonoma State) used race as a criterion in admissions--the rest were able to admit all eligible applicants (Naff, 1998). At Sonoma State there was no discernible break in the enrollment trends of URMs relative to non-URMs around the time Prop 209 was passed, suggesting that if racial preferences were in place prior to Prop 209, they were likely to have been fairly weak. At Cal Poly, however, the number of URMs in the fall freshman class fell from 455 to 227 between 1997 and 1998, while the number of non-URMs increased from 1,473 to 1,826, suggesting that Prop 209 did lower URMs' relative chances of admission. It is difficult to empirically assess the impact of the

²⁴ We have repeated this analysis for each individual campus and for those with relatively weak academic credentials, and our qualitative findings do not change.

change in admissions standards at Cal Poly on enrollment patterns in the UC, but it seems unlikely that the increase in the yield rates at schools like Berkeley, UCLA and UCSD, which were significantly more highly ranked than but similarly priced to Cal Poly, would have been greatly affected by changes to the admissions process at Cal Poly.²⁵

Although private schools were not bound by the provisions of Prop 209, Prop 209 still could have affected URMs' opportunities at private schools if Prop 209 pushed more URMs into the private college market, thereby increasing competition at private schools, and pushing a subset of students back to the UC. This would be more likely if the number of URMs enrolled in UC schools fell sharply after Prop 209, and if private schools competing for similar students (e.g., Stanford and Pomona) used racial quotas (or similar targets) that were be easier to achieve post-209, so that they could decrease their use of racial preferences as more URMs applied.

While our data do not allow us to directly examine what happened to URMs' relative chances of being admitted to schools outside the UC system after Prop 209, we can calculate the net drop in the number of URMs enrolled in the UC system after Prop 209. Assuming all of these students enrolled in college elsewhere, this tells us the number of URMs who needed to be "absorbed" by non-UC schools. Panel A of Table 7 shows the number of URMs who enrolled in the UC system both before and after Prop 209 by SAT math bracket. As the table shows, Prop 209 displaced remarkably few URMs from the UC system. This is both because total UC enrollments were growing and because even though admission rates fell substantially at schools like Berkeley and UCLA, the chances that URMs were admitted to the less selective UC schools remained relatively high, and many of those admitted enrolled.

²⁵ Out of all colleges in the U.S., Forbes magazine currently ranks Berkeley, UCLA and UCSD as 73rd, 78th, and 149th, while Cal Poly is ranked 201st. Kiplinger's also places Berkeley, UCLA and UCSD ahead of Cal Poly in terms of best value.

Using data from both the College Board and the UCOP, we also assess whether there was an increase in the number of URM relative to non-URMs who enrolled in schools *outside* the UC system after Prop 209. If so, then private schools using racial quotas may have responded to the greater number of URM by increasing the admission standards for URM. For the three-year period before and after Prop 209, we calculate the number of URM SAT-takers from California within each SAT math bracket and subtract from this the number of URM who enroll in the UC. Assuming everyone who takes the SAT eventually enrolls in college²⁶, this gives us an estimate of the number of URM in California within each SAT bracket who enrolled in college outside the UC. We then divide this by a similarly constructed estimate of the total number of students in California within each SAT bracket who attended college outside the UC. The results, shown in Panel B of Table 7, show that there was almost no change after Prop 209 in the fraction of California students who attended college outside the UC who were URM. Given the relatively small change in overall URM enrollment in the UC system shown in Panel A and the slow pace of change in the racial composition college-bound students over time, it is not surprising that the relative number of URM seeking admission outside the UC system remained constant. Thus our data provide little support for the hypothesis that private colleges changed their admissions standards for URM because of an increase in the relative supply of URM in the wake of Prop 209 or that URM were “pushed” towards the UC campuses after Prop 209 by colleges that were affected either directly or indirectly by the new ban on racial preferences.

Recruiting and Financial Aid

²⁶ Since this is a strong assumption for those with low SAT scores, we focus on individuals whose math SAT scores are greater than 500.

A third possible confounding effect is the change in financial aid and recruitment patterns that accompanied Prop 209. University officials were undoubtedly anxious about the impact of the new regime upon minority enrollment; if they introduced substantial new policies to make UC more attractive to URM students, that could have caused the warming effects we find. Our data does not have individual-level information on either financial aid or participation in recruiting programs. We have interviewed UC administrators and studied contemporaneous reports to evaluate how UC financial aid and recruitment policies changed after Prop 209.

On the financial aid front, it appears that blacks and Hispanics were slightly less likely to receive financial aid after Prop 209. Before 1996, the university had a variety of race-conscious scholarships, and it took the position that under Prop 209, these had to become race-neutral in their selection of recipients.²⁷ Some race-conscious funds established by donors were moved “offshore”, but this took time. The university undertook fairly rigorous auditing processes to insure that its own scholarship programs shifted to race-neutral methods.²⁸ The UC also had extensive need-based scholarships both before and after Prop 209 (this partly accounts for the unusually high socioeconomic diversity at UC schools), and the large majority of freshmen aid went to low-and-moderate income families irrespective of race.²⁹ Thus, race-based aid was never a very large proportion of UC aid. UC’s Director of Financial Aid, Kate Brenner, concluded (in an interview with us) that financial aid to URMs probably declined after Prop 209, but not dramatically. Thus, to the extent that financial aid affects yield rates, the changes in race-based aid would have produced a chilling effect, not a warming effect.

²⁷ “University of California Financial Aid Guidelines for Compliance with Proposition 209.”

²⁸ See UC Office of Financial Aid, “University of California: Overview of Compliance with Proposition 209”

²⁹ In 2000-01, the earliest year for which we have a breakdown of aid by income level, about 70% of UC’s gift aid went to students from families with incomes under \$48k. See <http://statfinder.ucop.edu/reports/financialaid/default.aspx?Year=2000-01>

On the recruitment side, although Prop 209 prevented university officials from distributing tangible benefits to URM students based on race (such as waiving application fees), it did not prevent them from launching programs aimed at building bridges to predominantly-minority high schools, encouraging the college aspirations of disadvantaged students, or reaching out to specific URM candidates to encourage them to apply to or to enroll at the UC. There is much evidence that they did all of these things. It is important to note, however, that such efforts took years to fully develop. In addition, in terms of our findings, the recruiting efforts cut both ways. If a student otherwise uninterested in the UC is persuaded to apply by a recruitment effort, that student is less likely than the average UC applicant to enroll if admitted, because their underlying interest in the UC is more tenuous. On the other hand, if an admitted student receives special attention and encouragement on a scale that did not occur before Prop 209, *ceteris paribus* that student is presumably more likely to enroll.

The most authoritative source on UC outreach efforts during this period is the strategic outreach plan unveiled by UCOP in September 1998 (Pister 1998). Our conclusions from this report, and the other archival material we have examined, are that first, most UC outreach efforts during this period focused on expanding the pool of applicants (which, as noted above, is likely to reduce yield rates); and second, the outreach programs developed in the wake of Prop 209 were ambitious and would take years to develop and even longer to affect the applicant pool. Thus, while we cannot rule out the possibility that recruiting might explain some of our observed “warming effect”, it seems unlikely that it accounts for all of our findings.

Finally, another possible explanation for the warming effects we find is the possibility that after Prop 209 a larger fraction of admitted URM students were student athletes who had higher enrollment propensities because of athletic recruiting. It is difficult to gauge the plausibility of

this explanation because we have no information on the effect of Prop 209 on the acceptance rate of athletes relative to other students or how the enrollment rates of athletes differ from those of other students. Nonetheless, it is worth pointing out we find consistent warming across the UC campuses despite the fact that they differ considerably in the size and scope of their athletic programs. For example, UCLA has a large athletic program, competes as a Division I school and is able to offer potential athletes a full scholarship, while UCSC has a relatively small athletics program, is a Division III school and is unable to offer any scholarships to help attract athletes.³⁰

The Timing of Student Responses to Prop 209

A final possibility is that Prop 209 would not have immediately deterred students' interest in attending UC schools because initially there still would have been a critical mass of URMs admitted under the old admissions regime. Thus, the chilling effects of Prop 209 may have been slow to take hold. One way of examining this question is to look at longer-term trends in URM enrollment patterns, but of course the further one moves from the time of Prop 209's implementation, the messier our natural experiment becomes. In particular, in 2001, the University of California instituted a major new route to eligibility and admission. The new initiative, Eligibility in the Local Context ("ELC"), guaranteed admission to at least one UC school for all California public high school students whose grades placed them in the top four percent of their class (a change inspired by the Texas "top ten percent" plan). This change is likely to complicate the analysis of enrollment patterns in ways that are hard to predict.

³⁰ UCSD was also a Division III school during the entire time period we examine.

Nonetheless, we can use another, more direct approach to evaluating the critical mass hypothesis by relating our estimated warming effects to the change in the share of fall freshman enrollees who were URMs across the UC different campuses after Prop 209. To that end, for each UC campus, Table 8 presents the share of Fall freshman enrollees who were URMs before Prop 209 and the change in that share after Prop 209. As the table reveals, the largest drops in the share of Fall freshman enrollees who were URMs occurred at the most selective UC schools. At Berkeley, for example, the URMs' Fall freshman enrollment share dropped from approximately 24 to 14 percent after Prop 209, while at UC Davis, URMs' Fall freshman enrollment share only dropped from approximately 15 to 13 percent, and at UC Irvine, UC Santa Barbara and UC Riverside, there was no statistically significant change in the share of Fall freshman enrollees who were URMs.

If the critical mass story is important, we might expect the chilling effects to be the largest at the schools where URMs' enrollment share dropped by the most, but Table 8 suggests the opposite relationship; as row 3 indicates, our estimated warming effects tend to be the largest at exactly those campuses where the fall in URMs' enrollment share was the largest, with the correlation between the change in URMs' enrollment share and our estimated warming effects being -0.65. Given that URMs are likely to have been aware that Prop 209 would have the largest impact on enrollment shares at the most selective UCs, this suggests that even if URMs were unhappy about the projected drop in the size of their own-race peer group at the different UC campuses, they were not dissuaded from enrolling in UC schools because of it.

A Signaling Explanation for the Warming Effect

None of the confounding effects discussed above can easily explain the relative increase in URM yield rates; so far as one can tell, the warming effect is real. What could explain it?

Removing the stigma of being a ‘special admit’ has both social and economic advantages. Being a URM admitted without a racial preference could increase the signaling value of one’s college degree; thus, Prop 209 may have increased the signaling value of a UC degree for URMs. In this section, we develop a simple signaling model in which future employers use the admissions standards at an individual’s college to make inferences about the individual’s unobservable skill, so that students who attend selective colleges have higher labor market earnings in part simply because employers believe (correctly) that students who attend more selective institutions are more able. Using our model, we show Prop 209 should have increased the signaling value of a UC degree the most for students with relatively weak academic credentials. We then test this prediction with our data.

Spence (1973) first explored the idea that schooling could increase labor market earnings by serving as a signal of underlying ability, and more recently, a number of empirical papers have found evidence supporting the view that that part of the return to schooling comes from its signaling value (for example, Jaeger and Page (1996) and Heckman et al. (2006)).

The signaling literature recognizes that the labor market returns to a strong signal can also be a stand-in for a broader set of outcomes that are harder to measure. Thus, our model easily could be modified to allow a student’s college peers and professors to use college as a signal of unobservable student attributes, and the benefits of a strong signal could have a non-economic component (such as having the respect of one’s fellow students). This is important, because even if high school students are oblivious to the signaling value of attending a particular college to future employers, it seems likely that high school students care deeply about how they

will be perceived by their peers at different campuses, and URM students who were admitted to the UC in the wake of Prop 209 undoubtedly were aware that they would be perceived differently by their fellow students than if they had been admitted prior to Prop 209. Indeed, in an interview, the head of admissions at UCSD commented that although some URM students have expressed discomfort with having so few own-race peers on campus, many also say they are proud to have been admitted without the benefit of affirmative action.

In the model, we suppose that individuals are endowed with two types of ability: academic ability, denoted A_A and non-academic ability, denoted A_N , where A_A and A_N are assumed to be independent.³¹ We assume that individuals are admitted to a given college or university if a weighted average of their academic and non-academic ability exceeds some threshold, S . That is, when

$$\alpha_1 A_A + \alpha_2 A_N \geq S.$$

Prospective employers care about both dimensions of ability because output upon graduation, Y , is assumed to depend on both A_A and A_N . That is,

$$Y = \beta_1 A_A + \beta_2 A_N.$$

Prospective employers can infer academic ability from an individual's college performance, but they cannot perfectly observe non-academic ability.³² Instead, employers make inferences about a person's non-academic ability based on the college admissions process. In particular, employers calculate

$$E[A_N | A_N \geq (S - \alpha_1 A_A) / \alpha_2],$$

³¹ A_n can also be thought of as the part of total ability not observed from an individual's academic record.

³² This assumption is trivial if one defines academic ability to be the part of total ability that can be inferred from college performance.

where, for simplicity, it is assumed that α_1 , α_2 and S are common knowledge. Further, labor markets are assumed to be perfectly competitive so that workers are paid their expected productivity. Given this, employers pay workers a wage, w , where

$$w = \beta_1 A_A + \beta_2 E[A_N | A_N \geq (S - \alpha_1 A_A) / \alpha_2],$$

and students enroll in a school if their expected wages from attending that school exceed their total costs of attendance, C , where C includes both out-of-pocket expenses and the value of the student's next best alternative. That is, students enroll if

$$\beta_1 A_A + \beta_2 E[A_N | A_N \geq (S - \alpha_1 A_A) / \alpha_2] - C \geq 0.$$

Given this very simple model, the key to understanding how Prop 209 might affect enrollment decisions is understanding how an increase in the threshold for admission, S , affects $E[A_N | A_N \geq (S - \alpha_1 A_A) / \alpha_2]$. If we assume that $A_N \sim N(\mu, \sigma)$, then it can be shown that $E[A_N | A_N \geq (S - \alpha_1 A_A) / \alpha_2]$ is increasing in S . Further, this increase is larger when S is large to begin with, so that increasing admissions thresholds should yield the greatest increase in expected ability at schools that are highly selective. The intuition is that there is little signaling value to attending a school with low admissions standards since most students are admitted, regardless of their ability. As a result, modest increases in S will do little to change people's beliefs about the quality of admitted students. On the other hand, since only high-ability students will be admitted to very selective schools (schools with high S), further increases in the admissions standard will translate directly into higher beliefs about the ability of those who are admitted. In the case of Prop 209, this feature of the model is reinforced by the fact that Prop 209 brought about the largest increases in the admission thresholds of URMs at the most selective UC campuses, since these campuses had the most aggressive affirmative action programs prior to Prop 209. This is reflected in Table 1,

where we see the largest relative drops in URMs' admission rates at the most selective UC campuses.

Another prediction of our model is that increases in S will yield the largest increases in expected non-academic ability for students' with low academic ability (that is, when A_A is small). The intuition is that when academic ability is very high, being admitted into college says very little about a person's non-academic ability, and small increases in the threshold for college admission have little effect on expectations about non-academic ability. On the other hand, when academic ability is low, this suggests that non-academic ability must be quite high, and as the threshold for college admission increases, this translates into directly into increases in the expected value of non-academic ability.

Thus, our model yields three testable predictions. First, Prop 209 (which had the effect of increasing S for URMs) should increase the relative yield rate of URMs. Second, the increase in the yield rate should be the larger at more selective campuses than at less selective campuses, and third the increases in the yield rate should be larger for URMs with low academic ability.

We have already seen that the first prediction is supported by our findings. In terms of the second prediction, note that the warming effects we find (see column (3) of Table 5) are the largest at the most selective UC campuses, and the largest estimated warming effect occurs at the most selective UC campus, Berkeley. The one exception to this pattern is UCR, where the yield rate of URMs rose by 3.1 percentage points relative to non-URMs, but this may reflect the more general perception, unrelated to signaling, that UCR was the most welcoming campus for minorities after Prop 209.

To examine our third prediction (that the increase in yield rates should be the largest for students with relatively low academic ability), we summarize a student's academic ability using

their predicted admission probability. In particular, for white students who applied before Prop 209 (1995-1997), we use OLS to regress a binary indicator for whether the student was admitted on math and verbal SAT scores, the square of math and verbal SAT scores, adjusted high school GPA, the square of adjusted high school GPA and controls for parental income and education. We do this separately for the UC System as a whole, Tier 1 schools (UCLA and Berkeley) and each of the eight UC campuses. We then use the point estimates from these regressions to predict the probability that each applicant to a given school (or set of schools) would have been admitted if they were white and had applied for admission before Prop 209. This predicted admission probability can be thought of as a one-dimensional measure of student quality where the weights on academic achievement and family background are determined by whites' pre-Prop 209 admission probabilities.³³ We then interact this predicted admission probability with our indicator for URM, with our indicator for post Prop 209 and with the interaction between post and URM, and add these interaction terms to Equation (1).

Results are presented in Table 9. The interaction between post and URM remains positive and is statistically different from zero at 4 of the eight UC campuses, for Tier 1 schools and for the UC system as a whole. In addition, at each of these schools (or groups of schools), the triple interaction between post, URM and predicted admission probability is negative and statistically different from zero. Thus, consistent with our signaling model, the warming effects found in Table 5 are larger for students with a low probability of admission.³⁴

IX. Conclusion

³³ Because of this we do not correct the standard errors to account for the fact that the weights used in creating this measure of student quality are generated from an auxiliary regression.

³⁴ Students with a low probability of admission are also those who might be the most concerned with the stigma associated with racial preferences in admission. A model in which students wish to avoid this kind of stigma would work in a parallel fashion to the one presented above.

The number of URMs enrolled at the most elite UC campuses fell by as much as fifty percent in the wake of Prop 209. Much of the public debate surrounding Prop 209 has suggested that this drop was the result of the “chilling effect” that Prop 209 had on URMs’ interest in attending the UC. This paper, however, suggests that the fall in total enrollment arose not because URMs were no longer interested in attending UC schools, but rather because they were admitted at much lower rates. In particular, we find no evidence that Prop 209 reduced the probability that URMs admitted to UC schools chose to enroll. Rather, we find a warming effect: URMs were substantially more likely to accept offers of admissions from UC schools after the ban on racial preferences went into effect. Enrollment probabilities for whites and Asians went up as well, but even relative to these groups, URM enrollment rates went up by small but statistically significant amounts, and these results hold even after controlling for students’ academic credentials, family background and choice set within the UC system.

Changes in the selection of students who applied to the UC do not appear to account for this relative increase in URM yield rates. In addition, changes in financial aid and changes in URMs’ college opportunities outside the UC are unable to explain the consistent pattern of increasing URM yield rates across campuses. While we cannot rule out the possibility that recruiting initiatives partly account for our findings, we emphasize that the effect of recruiting on yield rates is not obvious. Instead, we hypothesize that Prop 209 may have increased the signaling value of attending a UC school for URMs. Consistent with this, we find that the warming effect is strongest at the most selective UC campuses and for students with relatively weak academic credentials, those who should be the most concerned about the signaling value of their bachelor’s degree.

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DATA APPENDIX

The Office of the President at the University of California (UCOP) has, for many years, gathered systematic data from the various UC campuses and has integrated this individual-level data into a master database of UC students. Covering every applicant for Fall freshman admission to UC, and every enrolled UC freshman from 1992 through 2006, the dataset includes over thirty variables on nearly one million applicants and students at the eight UC undergraduate campuses, including each person's application characteristics (academic achievement, family background), each campus applied to, the outcome of each application, the campus (if any) the applicant eventually enrolled in, the student's intended and eventual major, the student's academic performance in college and his or her eventual graduation outcomes.

Note that although the complete data set spans 15 years, the analysis in this paper focuses on the three-year period immediately before and the three-year period immediately after the implementation of Prop 209. The data before 1995 do not allow us to calculate enrollment rates, and starting in 2001 there was a second major change to the admissions process at the UC that also may have affected enrollment rates.

To protect student confidentiality UCOP released to us a version of this dataset that collapsed many variables into broader categories. As mentioned in the text, race was condensed into four categories, and year of application was grouped into three-year cohorts. Also in an effort to protect student confidentiality, UCOP grouped SAT scores into 50-point intervals and UC adjusted high school GPA into 0.25-point intervals, where UC adjusted high school GPA is a student's GPA in courses required for admission to the UC, with additional points given for honors courses.

Additionally, some variables are inexact because of UCOP's original data collection methods. For example, income data was only gathered in \$10k increments, with ">\$100k" the top category, and "parental education" was gathered only for the parent with the highest educational attainment. Due to the discrete nature of the income variable, we do not adjust for inflation.

In terms of race, it is important to assess the likely race of students in the "Other/Unknown" category because, while the overall number of applicants to the UC system was approximately 20 percent higher in the post-Prop 209 period (1998-2000) than in the pre-Prop 209 period (1995-1997), the number of students in the "Other/Unknown" group increased by over 120 percent, rising from 6 percent to 11 percent of the total. Using aggregate application numbers from the UC-System's StatFinder web page³⁵, we investigated these changes in application numbers. As it turns out, the large jump in the number of applicants in the "Other/Unknown" category in the post Prop 209 period, is driven by a sharp jump in 1998 in the number of applicants who chose not to report their race (the "Unknown" category) rather than by an increase in the number of students who report their race as "Other". In addition, the 1998 jump in the "Unknown" category corresponds to a similarly sized drop in 1998 in the number of applications from Whites and a downward break in the trend for Asians, suggesting that students who do not report their race in 1998 (those in the "Unknown" category) are primarily White and Asian.³⁶ In addition, using the UCOP data, we can see that the average characteristics of students in the "Other/Unknown" category more closely match the average characteristics of Whites and Asians than those of URMs. For example, in our sample, the average Math SAT score for students applying before Prop 209 is 608.3 for students in the "Other/Unknown" group,

³⁵ <http://statfinder.ucop.edu/>

³⁶ A plot of application numbers by year and race is available upon request.

608.4 for Whites, 626.2 for Asians, and 527.9 for URMs. For the purposes of this analysis, therefore, we combine the categories White, Asian and “Other/Unknown” into the category “non-URMs.”

For most variables, the UCOP dataset has very few missing values. An exception is the data on family background, especially parental income. Table A1 shows the percentage of missing values for students who are admitted to the UC system for the key demographic and family background characteristics used in our analysis. As the table shows, in the years prior to Prop 209 going into effect (1995-1997), approximately 11.7 percent of all students who were admitted to the UC system had missing values for parental income, and after Prop 209, this number jumps to approximately 19.6 percent.

In the UCOP data, missing values arise because students sometimes choose not to fill out certain pieces of information when they complete their applications.³⁷ A possible explanation for why students choose not to report parental income is that the UC system gives preferential treatment to students from disadvantaged backgrounds, and as a result, students from relatively advantaged backgrounds may be reluctant to reveal information they feel will hurt their chances of admission.³⁸ Indeed, since there was a perception that schools in the UC system would place a heavier weight on family background characteristics after Prop 209 went into effect, this may help explain why the percentage of students who chose to not reveal parental income jumped after Prop 209.

In our initial analysis, we drop observations with missing values for parental income as well as the other demographic and family background variables we use in our analysis. As the second to last row of Table A1 indicates, this implies that we lose 14.2 percent of all

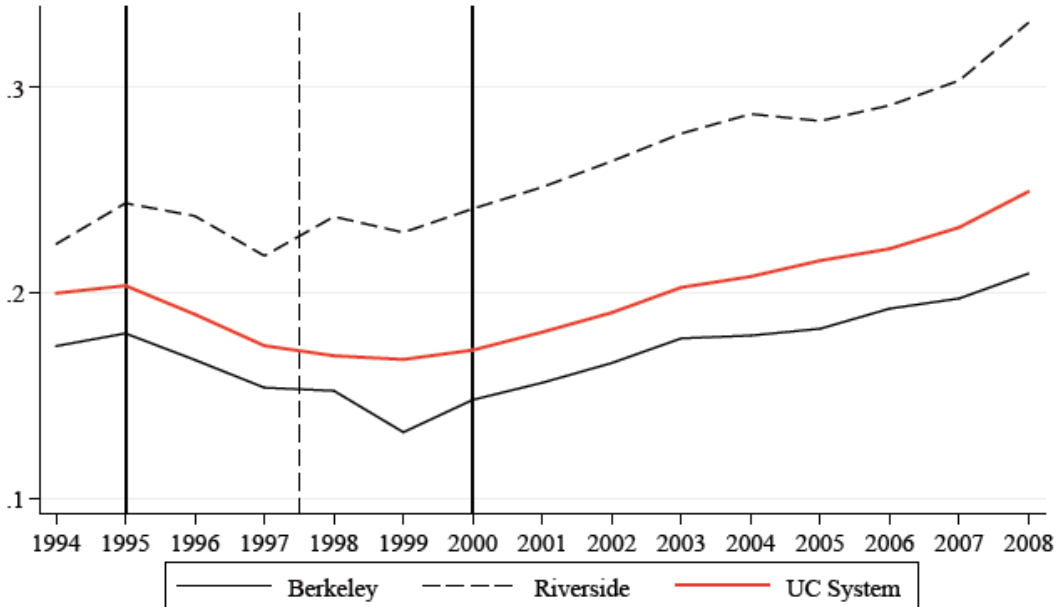
³⁷ Missing values, especially for parental income, are a problem in most student databases relying on self-reports.

³⁸ Staff in the admissions office at UCSD believe that this is the most plausible explanation.

observations in the years before Prop 209 and 21.8 percent of all observations in the period after Prop 209. We then investigate whether our results are sensitive to the exclusion of observations with missing values.³⁹

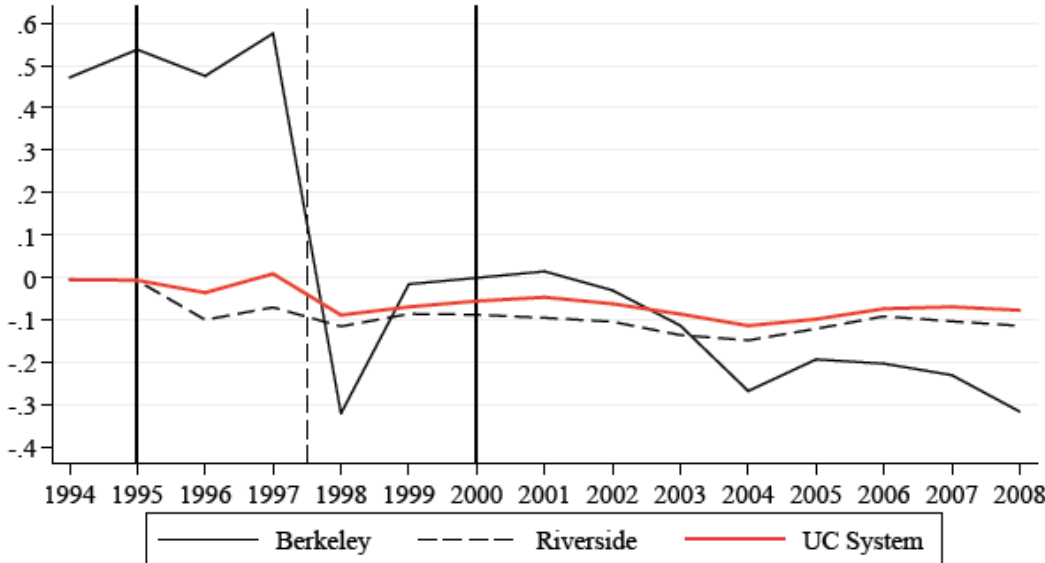
³⁹ Tables 1 and 2 also compare the average characteristics of individuals with missing values to those without missing values.

Figure 1: URMs' Share of Fall Freshman Applicants



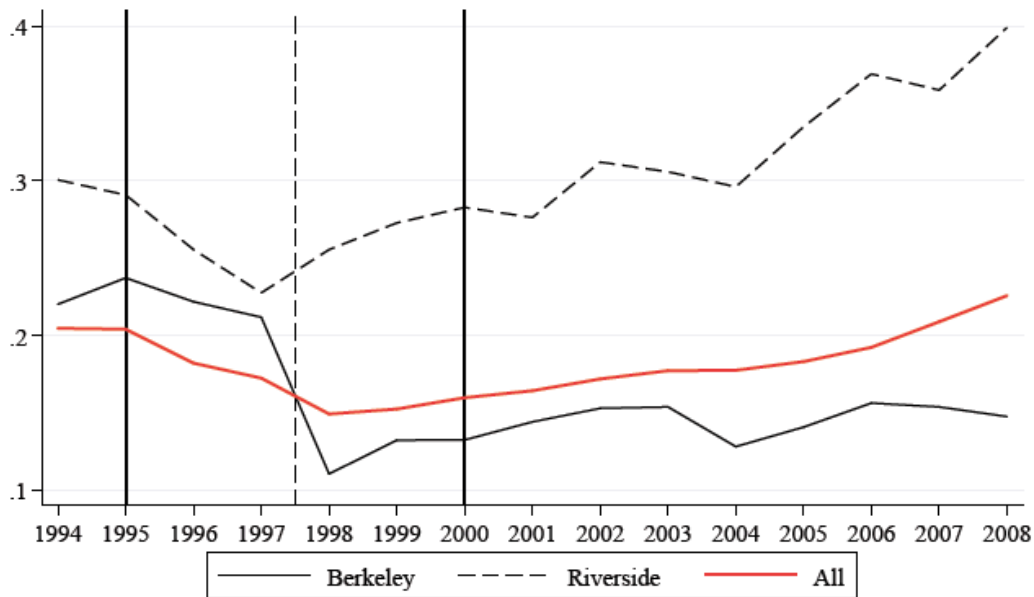
Note: The bold vertical lines at 1995 and 2000 bracket the years over which our primary analysis is conducted. The dashed vertical line separates the period before and after Prop 209.

Figure 2: Percentage Difference Between URM and Non-URM Fall Freshman Admission Rate



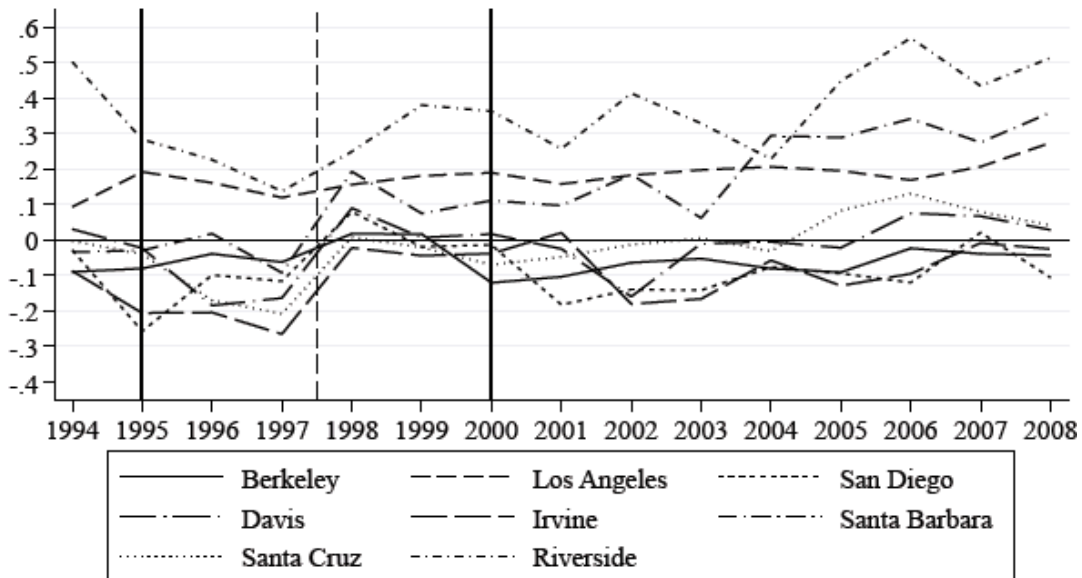
Note: Shows the difference in the admission rate for URMs and non-URMs as a fraction of the admission rate for non-URMs. When the gap is positive, it indicates that the admission rate is higher for URMs than non-URMs. The bold vertical lines at 1995 and 2000 bracket the years over which our primary analysis is conducted. The dashed vertical line separates the period before and after Prop 209.

Figure 3: URMs' Share of Fall Freshman Enrollees



Note: The bold vertical lines at 1995 and 2000 bracket the years over which our primary analysis is conducted. The dashed vertical line separates the period before and after Prop 209.

Figure 4: Percentage Difference Between URM and Non-URM Fall Freshman Enrollment Rates



Note: Shows the difference in the enrollment rate for URMs and non-URMs as a fraction of the enrollment rate for non-URMs. When the gap is positive, it indicates that the enrollment rate is higher for URMs than non-URMs. The bold vertical lines at 1995 and 2000 bracket the years over which our primary analysis is conducted. The dashed vertical line separates the period before and after Prop 209.

Table 1: Mean Characteristics of Students Who Apply to the UC System and Admission Probabilites for Each Campus

	Observations with Missing Data		Observations with Complete Data						
	All		All		Non-URM		URM		URM Relative Change
	Before	After	Before	After	Before	After	Before	After	
SAT Math	615.9 (93.4)	628.0 (87.5)	597.1 (93.6)	601.9 (93.3)	613.8 (85.8)	617.4 (86.0)	527.9 (93.0)	533.5 (93.1)	2.0**
SAT Verbal	584.3 (100.8)	598.1 (95.1)	569.5 (97.0)	572.3 (96.1)	580.2 (94.7)	582.6 (93.8)	525.0 (93.5)	527.1 (93.2)	-0.2
Adjusted High School GPA	3.56 (0.51)	3.65 (0.50)	3.62 (0.50)	3.65 (0.49)	3.66 (0.50)	3.68 (0.49)	3.45 (0.48)	3.51 (0.49)	0.04***
Parents' Education: At Least 4 Year College Degree	0.70 (0.46)	0.76 (0.43)	0.66 (0.47)	0.65 (0.48)	0.73 (0.44)	0.72 (0.45)	0.37 (0.48)	0.36 (0.48)	0.00
Parents' Income <\$40,000	0.44 (0.50)	0.35 (0.48)	0.33 (0.47)	0.29 (0.46)	0.28 (0.45)	0.25 (0.43)	0.54 (0.50)	0.49 (0.50)	-0.02***
Parents' Income \$40,000-\$99,999	0.36 (0.48)	0.38 (0.49)	0.43 (0.50)	0.42 (0.49)	0.45 (0.50)	0.42 (0.49)	0.37 (0.48)	0.38 (0.49)	0.04***
Parents' Income >\$100,000	0.20 (0.40)	0.27 (0.44)	0.24 (0.43)	0.29 (0.45)	0.27 (0.44)	0.33 (0.47)	0.10 (0.30)	0.13 (0.34)	-0.02***
Admitted to Berkeley	0.36	0.29	0.36	0.27	0.32	0.28	0.52	0.25	-0.22***
Admitted to UCLA	0.36	0.31	0.40	0.31	0.38	0.32	0.47	0.25	-0.16***
Admitted to UCSD	0.54	0.42	0.59	0.42	0.59	0.44	0.58	0.32	-0.11***
Admitted to UCD	0.67	0.62	0.74	0.66	0.72	0.67	0.85	0.62	-0.18***
Admitted to UCI	0.60	0.56	0.72	0.61	0.73	0.63	0.68	0.53	-0.05***
Admitted to UCSB	0.70	0.52	0.78	0.54	0.78	0.54	0.78	0.52	-0.02***
Admitted to UCSC	0.75	0.77	0.84	0.81	0.84	0.82	0.84	0.76	-0.05***
Admitted to UCR	0.69	0.81	0.84	0.87	0.85	0.88	0.81	0.82	-0.02***
Admitted to UCLA or Berkeley	0.38	0.32	0.41	0.32	0.38	0.33	0.51	0.27	-0.18***
Admitted to Any UC	0.70	0.70	0.81	0.78	0.81	0.79	0.81	0.74	-0.05***
N	26,306	46,370	136,766	149,305	110,072	121,598	26,694	27,707	

Notes: Standard deviations in parentheses. Before includes years 1995-1997. After includes year 1998-2000. Non-URMs include Whites, Asians and Other/Unknown. URMs include Blacks, Hispanics and American Indians. The summary statistics for each cell in columns (1) and (2) are computed for observations with missing data for at least one of the variables listed so that the cell sizes for each variable differ. The final row of columns (1) and (2) shows the number of observations with any missing data. The final column shows the change for URMs relative to non-URMs. Admission probabilities are conditional on applying. Throughout our tables, unless otherwise noted, our source is the student-level UCOP data described in Section V.

*** p<0.01, ** p<0.05, * p<0.1.

Table 2: Mean Characteristics of Students Admitted to the UC System

	Observations with Missing Data		Observations with Complete Data						URM Relative Change
	All		All		Non-URM		URM		
	Before	After	Before	After	Before	After	Before	After	
SAT Math	628.7 (86.0)	637.4 (81.2)	607.8 (88.9)	611.4 (88.4)	624.0 (80.5)	625.2 (81.6)	541.0 (90.6)	546.7 (90.5)	4.5***
SAT Verbal	602.7 (94.3)	611.1 (89.2)	580.7 (93.9)	581.9 (93.4)	591.3 (91.2)	591.3 (91.0)	537.0 (92.0)	538.1 (92.0)	1.1
Adjusted High School GPA	3.68 (0.49)	3.76 (0.46)	3.70 (0.48)	3.74 (0.46)	3.74 (0.47)	3.77 (0.46)	3.53 (0.49)	3.63 (0.47)	0.07***
Parents' Education: At Least 4 Year College Degree	0.74 (0.44)	0.79 (0.41)	0.67 (0.47)	0.65 (0.48)	0.74 (0.44)	0.72 (0.45)	0.38 (0.49)	0.35 (0.48)	-0.01
Parents' Income <\$40,000	0.43 (0.50)	0.35 (0.48)	0.33 (0.47)	0.30 (0.46)	0.28 (0.45)	0.25 (0.44)	0.52 (0.50)	0.49 (0.50)	-0.01***
Parents' Income \$40,000-\$99,999	0.37 (0.48)	0.39 (0.49)	0.44 (0.50)	0.42 (0.49)	0.45 (0.50)	0.42 (0.49)	0.38 (0.48)	0.38 (0.49)	0.04***
Parents' Income >\$100,000	0.20 (0.40)	0.25 (0.44)	0.24 (0.43)	0.29 (0.45)	0.27 (0.44)	0.32 (0.47)	0.10 (0.30)	0.13 (0.34)	-0.02***
N	18,395	32,503	111,368	116,493	89,661	96,024	21,707	20,469	

Notes: Standard deviations in parentheses. Before includes years 1995-1997. After includes years 1998-2000. Non-URMs include Whites, Asians and Other/Unknown. URMs include Blacks, Hispanics and American Indians. The summary statistics for each cell in columns (1) and (2) are computed for observations with missing data for at least one of the variables listed so that cell sizes for each variable differ. The final row of columns (1) and (2) shows the number of observations with any missing data. The final column shows the change for URMs relative to non-URMs. *** p<0.01, ** p<0.05, * p<0.1.

Table 3: Average Characteristics of Students Who Do Not Enroll Compared to Students Who Do Enroll, Among Admitted Students at Selected Schools

Variables	Admitted to Any UC			Admitted to Berkeley			Admitted to Riverside		
	Do Not Enroll	Difference if Enroll	Standard Error of Difference	Do Not Enroll	Difference if Enroll	Standard Error of Difference	Do Not Enroll	Difference if Enroll	Standard Error of Difference
SAT Math	610.0	-0.6	(0.375)*	674.4	-14.4	(0.720)***	583.2	-31.8	(0.987)***
SAT Verbal	586.1	-8.4	(0.395)***	658.2	-25.7	(0.787)***	539.7	-27.8	(0.965)***
Adjusted High School GPA	3.73	-0.02	(0.002)***	4.08	-0.11	(0.003)***	3.57	-0.16	(0.005)***
Parents' Income <\$40,000	0.28	0.05	(0.002)***	0.27	0.05	(0.005)***	0.39	0.07	(0.005)***
Parents' Income \$40,000-99,999	0.43	-0.01	(0.002)***	0.41	-0.01	(0.005)**	0.40	0.000	(0.005)
Parents' Income >\$100,000	0.28	-0.04	(0.002)***	0.32	-0.04	(0.005)***	0.21	-0.07	(0.004)***
Parents' Education: At Least 4 Year College Degree	0.68	-0.03	(0.002)***	0.75	-0.051	(0.004)***	0.58	-0.08	(0.005)***

Asterisks indicate whether the difference in the mean for students who do and do not enroll is statistically different from zero, *** p<0.01, ** p<0.05, * p<0.1.

Table 4: Yield Rates Before and After Prop 209, by Race

	UC System (1)	Tier 1 (2)	Berkeley (3)	UCLA (4)	UCSD (5)	UCD (6)	UCI (7)	UCSB (8)	UCSC (9)	UCR (10)
Panel A: Pre Prop 209 (1995-1997)										
URM	54.6%	49.7%	37.9%	38.8%	20.2%	23.4%	20.4%	23.0%	18.1%	23.2%
Non-URM	55.0%	48.3%	40.6%	33.8%	23.9%	26.7%	26.0%	23.8%	20.8%	19.1%
Asian	61.4%	54.0%	46.1%	34.2%	24.0%	28.7%	30.1%	17.6%	14.1%	19.1%
White	50.7%	42.9%	35.6%	33.7%	24.3%	25.8%	19.0%	27.2%	23.3%	19.6%
Other/Undeclared	50.2%	45.4%	37.5%	31.7%	21.1%	22.4%	22.0%	18.1%	22.6%	17.8%
Panel B: Post Prop 209 (1998-2000)										
URM	52.7%	54.2%	41.0%	44.6%	24.4%	27.5%	25.6%	27.3%	19.4%	24.8%
Non-URM	55.0%	53.7%	42.7%	38.1%	23.9%	26.4%	26.3%	24.3%	19.8%	18.6%
Asian	62.1%	59.6%	48.2%	38.2%	24.1%	28.2%	29.6%	16.6%	14.4%	21.3%
White	50.2%	48.2%	37.5%	38.2%	24.1%	26.5%	21.1%	28.0%	22.0%	15.3%
Other/Undeclared	51.6%	51.2%	40.0%	37.5%	22.9%	20.3%	24.1%	24.0%	21.7%	15.3%
Panel C: Change										
URM	-1.9%	4.5%	3.1%	5.8%	4.1%	4.1%	5.1%	4.3%	1.3%	1.6%
Non-URM	0.1%	5.4%	2.1%	4.3%	0.0%	-0.3%	0.3%	0.5%	-1.0%	-0.6%
Asian	0.7%	5.6%	2.2%	4.0%	0.1%	-0.6%	-0.5%	-1.0%	0.4%	2.2%
White	-0.5%	5.3%	1.9%	4.5%	-0.2%	0.7%	2.1%	0.8%	-1.3%	-4.3%
Other/Undeclared	1.4%	5.7%	2.5%	5.8%	1.7%	-2.1%	2.1%	5.8%	-0.8%	-2.4%
Change for URMs vs. Non-URMs										
	-2.0%	-1.0%	1.0%	1.5%	4.1%	4.4%	4.9%	3.8%	2.3%	2.2%

Notes: Column (1) shows the probability that students admitted to any UC school enroll in any UC school. Column (2) shows the probability that students admitted to either Berkeley or UCLA (Tier 1) enroll in either school. The remaining columns show the probability that students admitted to the school given in the column heading enroll in that school. The last row shows the difference between the change in enrollment rates for URMs and non-URMs.

Table 5: Difference-in-Difference Estimates of the Effect of Prop 209 on Enrollment Rates for URM

	(1)	(2)	(3)	(4)	(5)	(6)
UC System	-0.025*** (0.005)	-0.026*** (0.005)	0.021*** (0.005)	-0.020*** (0.005)	-0.001 (0.005)	0.025*** (0.005)
Tier 1	-0.014 (0.010)	0.024** (0.009)	0.031*** (0.009)	-0.01 (0.009)	-0.005 (0.009)	0.033*** (0.009)
Berkeley	0.001 (0.013)	0.055*** (0.012)	0.057*** (0.012)	0.01 (0.012)	0.011 (0.011)	0.063*** (0.012)
UCLA	0.019* (0.011)	0.065*** (0.010)	0.039*** (0.010)	0.015 (0.010)	-0.005 (0.009)	0.037*** (0.010)
UCSD	0.042*** (0.010)	0.083*** (0.010)	0.028*** (0.009)	0.041*** (0.009)	0.003 (0.009)	0.024*** (0.009)
UCD	0.045*** (0.009)	0.066*** (0.009)	0.034*** (0.009)	0.044*** (0.009)	0.019** (0.008)	0.037*** (0.008)
UCI	0.045*** (0.010)	0.059*** (0.009)	0.011 (0.009)	0.049*** (0.009)	0.001 (0.008)	0.018** (0.008)
UCSB	0.029*** (0.008)	0.034*** (0.008)	-0.004 (0.008)	0.038*** (0.008)	-0.007 (0.007)	0.002 (0.007)
UCSC	0.021** (0.009)	0.031*** (0.009)	0.016* (0.008)	0.023*** (0.008)	0.006 (0.008)	0.016** (0.008)
UCR	0.020** (0.008)	0.033*** (0.008)	0.031*** (0.008)	0.022*** (0.008)	0.027*** (0.008)	0.036*** (0.008)
Controls for Academic Achievement and Family Background	no	yes	yes	no	no	yes (except parental income)
Controls for Students' Choice Set	no	no	yes	no	yes	yes
Sample	Students with complete data			All admitted students	All admitted students	Students with complete data (except parental income)

Notes: Standard errors in parentheses. The dependent variable is a binary indicator for whether the student enrolled in a given UC school conditional on being accepted to that UC school. Each row shows the OLS coefficient estimate on the interaction between post Prop 209 and URM. Each column also includes controls for URM and post Prop 209.

Students' SAT math and SAT verbal scores are each controlled for using 7 categories: 200-449, 450-499, 500-549, 550-599, 600-649, 650-699 and 700-800. Parental income is controlled for using 11 categories: 0-10k, 10-20k, 20-30k, 30-40k, 40-50k, 50-60k, 60-70k, 70-80k, 80-90k, 90-100k, >100k. Parental education is controlled for using 6 categories for the maximum of parents' education: less than a high school degree, high school degree, some college, two-year college degree, four-year college, post graduate study. The sample includes data from 1995-1997 (pre Prop 209) and 1998-2000 (post Prop 209).

*** p<0.01, ** p<0.05, * p<0.1

Table 6: Mean Characteristics of California High School Graduates Who Sent SAT Scores to UC Campuses Before and After Prop 209

	Non-URM ¹		URM ¹		URM Relative Change	
	Before	After	Before	After		
College Preferences²						
College Location: Close to Home	0.31	0.31	0.38	0.40	0.01	***
College Location: In-State	0.69	0.71	0.66	0.68	0.00	
College Location: Nearby State	0.17	0.15	0.13	0.13	0.02	***
College Location: Far Away State	0.23	0.21	0.20	0.19	0.02	***
College Location: Outside US	0.04	0.04	0.04	0.04	0.00	***
College Location: Undecided	0.16	0.15	0.12	0.12	0.00	
College Location: Number of Boxes Checked	1.61	1.57	1.55	1.56	0.05	***
College Size: <1,000	0.05	0.04	0.05	0.05	0.01	***
College Size: 1,000-5,000	0.20	0.18	0.21	0.20	0.01	***
College Size: 5,000-10,000	0.35	0.33	0.34	0.34	0.02	***
College Size: 10,000-20,000	0.36	0.36	0.32	0.33	0.01	**
College Size: >20,000	0.21	0.22	0.18	0.19	0.00	*
College Size Undecided	0.37	0.39	0.33	0.34	-0.01	***
College Size: Number of Boxes Checked	1.53	1.52	1.44	1.45	0.03	***
College Type: Religious	0.15	0.15	0.15	0.15	0.00	
College Type: Public	0.82	0.84	0.81	0.84	0.01	***
College Type: Private	0.47	0.46	0.42	0.41	0.00	
College Type: Undecided	0.10	0.09	0.08	0.08	0.00	
College Type: Number of Boxes Checked	1.54	1.54	1.47	1.48	0.01	***
Score Sending Behavior						
Number of Colleges Sent Score To	6.67	6.71	5.98	6.12	0.10	***
Number of UC's Sent Score To	2.81	3.00	2.20	2.32	-0.07	***
N	161,046	172,891	57,070	59,359		

Note 1: URM is defined as Black, Hispanic, and Native American. Non-URM is defined as White, Asian, and Other. Observations with missing race are not included. Source: College Board's Test Takers Database (see text for details).

Note 2: A student is able to choose more than one response per question in the college preference section. Number of boxes checked is the total number of answers marked per question.

*** p<0.01, ** p<0.05, * p<0.1

Table 7: Total URM Enrollment in the UC and The Racial Composition of California SAT Takers Net of UC Enrollment Before and After Prop 209, by SAT Math Bracket

	SAT Math Bracket				
	500-549	550-599	600-649	650-699	700-
<i>Panel A: Number of URMs Enrolled in the UC as Fall Freshman</i>					
Pre 209	2,759	2,498	1,922	974	471
Post 209	2,442	2,590	1,886	1,043	527
Change	-317	92	-36	69	56
<i>Panel B: Percentage of CA SAT Takers Not Enrolled in the UC Who Are URMs</i>					
Pre-209	21.2%	15.5%	11.0%	8.8%	5.3%
Post-209	21.6%	15.4%	11.2%	8.5%	5.3%
Change	0.4%	-0.1%	0.2%	-0.3%	0.0%

Notes: The percentages in this table are calculated by dividing the number of URM SAT takers in California within each SAT math bracket less the number of URMs enrolled in the UC in each bracket by the total number of SAT takers within each bracket less the total number enrolled in the UC in each bracket. The period before Prop 209 is 1995-1997, and the period after Prop 209 is 1998-2000. Source: College Board's Test Takers Database (see text for details).

Table 8: Percent URM Among Fall Freshman Enrollees Compared to the Estimated Warming Effect, by School

	Tier 1	Berkeley	UCLA	UCSD	UCD	UCI	UCSB	UCSC	UCR
Pre Prop 209	0.24	0.22	0.26	0.13	0.15	0.13	0.18	0.18	0.26
Change Post Prop 209	-.098***	-.098***	-.099***	-.02***	-.017***	0.0046	-0.0049	-.016*	0.016
Estimated Warming Effect ¹	.031***	.057***	.039***	.028**	.034***	0.011	-0.004	0.016	.031***
Correlation Between Change in Percent URM and the Estimated Warming Effect:	-0.65								

¹ The estimated warming effect is the coefficient on Post*URM from Column 3 of Table 5.

*** p<0.01, ** p<0.05, * p<0.1.

Table 9: Difference-in-Difference Estimates of the Differential Effect of Prop 209 on Enrollment Rates by Student Quality (Measured as White Pre-Prop 209 Predicted Admission Probability)

	UC (1)	Tier 1 (2)	Berkeley (3)	UCLA (4)	UCSD (5)	UCD (6)	UCI (7)	UCSB (8)	UCSC (9)	UCR (10)
URM	-0.029* (0.016)	-0.120*** (0.012)	-0.255*** (0.015)	-0.108*** (0.012)	-0.140*** (0.014)	-0.240*** (0.016)	-0.244*** (0.019)	-0.034** (0.017)	0.011 (0.026)	-0.102*** (0.031)
Post Prop 209	-0.028** (0.013)	0.098*** (0.011)	0.057*** (0.014)	0.092*** (0.013)	0.093*** (0.014)	0.009 (0.014)	0.002 (0.017)	0.162*** (0.019)	0.076*** (0.023)	0.040 (0.024)
Post*URM	0.076*** (0.022)	0.087*** (0.018)	0.108*** (0.022)	0.073*** (0.019)	-0.026 (0.024)	0.059** (0.023)	0.098*** (0.030)	-0.032 (0.031)	-0.055 (0.037)	0.065 (0.041)
Predicted Admission Prob.	0.732*** (0.049)	0.417*** (0.060)	0.239*** (0.075)	0.037 (0.042)	-0.062** (0.025)	-0.186*** (0.027)	-0.216*** (0.036)	-0.092*** (0.020)	0.146*** (0.035)	-0.088** (0.036)
Post*Predicted Admission Prob.	0.060*** (0.016)	-0.050*** (0.017)	-0.036* (0.021)	-0.044*** (0.017)	-0.077*** (0.017)	-0.012 (0.016)	0.019 (0.019)	-0.116*** (0.021)	-0.089*** (0.025)	-0.071*** (0.027)
URM*Predicted Admission Prob.	-0.084*** (0.020)	0.006 (0.024)	0.167*** (0.032)	0.086*** (0.023)	0.132*** (0.020)	0.192*** (0.021)	0.212*** (0.024)	0.035* (0.020)	-0.057* (0.031)	0.102*** (0.036)
Post*URM*Predicted Adm. Prob.	-0.063** (0.028)	-0.185*** (0.036)	-0.223*** (0.049)	-0.136*** (0.035)	0.026 (0.032)	-0.054* (0.030)	-0.126*** (0.036)	0.017 (0.035)	0.078* (0.043)	-0.050 (0.047)
Observations	227,861	71,344	41,448	52,627	63,968	69,640	63,627	72,394	54,264	53,530
R-squared	0.097	0.070	0.076	0.161	0.132	0.133	0.173	0.107	0.100	0.104

Notes: Standard errors in parentheses. The dependent variable is a binary indicator for whether a student enrolled in a given school conditional on being accepted to that school, and coefficient estimates are generated using OLS. For each school, predicted admission probabilities are calculated from the coefficient estimates from an OLS regression for the sample of whites who applied prior to Prop 209 (1995-1997) of a binary indicator for whether the student was admitted on that student's math and verbal SAT scores, adjusted high school GPA, parental income and parental education. Each column includes controls for SAT scores, high school GPA, parental education, parental income and indicators for the other UC schools to which the applicant was admitted. Students' SAT math and SAT verbal scores are each controlled for using 7 categories: 200-449, 450-499, 500-549, 550-599, 600-649, 650-699 and 700-800. Parental income is controlled for using 11 categories: 0-10k, 10-20k, 20-30k, 30-40k, 40-50k, 50-60k, 60-70k, 70-80k, 80-90k, 90-100k, >100k. Parental education is controlled for using 6 categories for the maximum of parents' education: less than a high school degree, high school degree, some college, two-year college degree, four-year college, post graduate study. The sample includes data from 1995-1997 (pre Prop 209) and 1998-2000 (post Prop 209). *** p<0.01, ** p<0.05, * p<0.1

Table A1: Percentage of Admitted Students with Missing Values for Select Variables

	All		Non-URM		URM	
	Before	After	Before	After	Before	After
SAT Math	1.4%	1.2%	1.1%	1.0%	3.0%	2.2%
SAT Verbal	1.4%	1.2%	1.1%	1.0%	3.0%	2.2%
Adjusted High School GPA	1.0%	1.4%	1.1%	1.5%	0.6%	0.8%
Parental Education	4.0%	5.4%	4.4%	5.9%	2.2%	3.0%
Parental Income	11.7%	19.6%	12.8%	21.1%	6.8%	11.4%
Any of Above	14.2%	21.8%	14.9%	23.3%	10.9%	14.3%
N	129,763	148,996	105,411	125,116	24,352	23,880

Notes: Numbers in the table shows the percentage of students admitted into at least one school in the UC system who have missing values for selected variables. Before Prop 209 includes the years 1995-1997. After Prop 209 includes the years 1998-2000. Non-URMs include Whites, Asians and Other/Unknown. URMs include Blacks, Hispanics and American Indians. The final row shows the total number of admitted students in each column.