EXECUTIVE SUMMARY

In order to promote socioeconomic mobility and counterbalance pre-existing educational disparities, many universities implement admissions policies that target and provide access to variously disadvantaged applicants. More than 20 years ago, Proposition 209 ended one such policy at the University of California: its decades-old race-based affirmative action policy. The end of affirmative action led to declines in the likelihood of admission for applicants from underrepresented groups (URG) across all UC campuses (especially Berkeley and UCLA, where their likelihood of admission fell by more than 25 percentage points), and URG applicants to UC became more than 5 percentage points less likely to enroll at any UC campus.

This brief asks two questions. First, how did the end of affirmative action impact educational and labor market outcomes for URG UC applicants, given the decline in their likelihood of UC enrollment? Second, how have the race-blind policies targeting disadvantaged applicants implemented by UC over the past 20 years impacted URG enrollment at UC, relative to the impact of affirmative action?

We answer the first question by linking the universe of 1995-1999 California-resident freshman UC applications (two years before and after Prop. 209 took effect) to outcomes from two sources: the National Student Clearinghouse, which allows us to observe applicants' degree attainment at nearly all US colleges and universities, and California's Employment Development Department, which provides quarterly earnings information for California employees. We find evidence that Prop. 209 caused more than 1 percent of URG UC applicants to never earn any university degree (within 6 years) as a result of their decreased likelihood of UC admission. URG applicants also became less likely to ever earn graduate degrees, and their average CA wages through their 20s declined by about 3% per year.

The evidence presented below suggests that affirmative action increased systemwide URG enrollment by at least 12%. The two largest-scale admissions policies adopted by UC since Prop. 209 to target disadvantaged applicants are its Eligibility in the Local Context (ELC) program and the campus-by-campus implementation of Holistic Review as their applicant evaluation method. Between 2001 and 2011, ELC (de facto) guaranteed admission to most UC campuses for applicants with grades in the top four percent of their high school graduating class. We show that ELC increased UC's URG enrollment by about 3.5% until 2011, though in recent years it has ceased having any substantive impact on URG enrollment.

Holistic Review has been adopted by six UC campuses: Berkeley, UCLA, Irvine, San Diego, Davis, and Santa Cruz. While Holistic Review does not advantage URG applicants directly, URG applicants may nevertheless benefit as a result of their increased likelihood of facing other observed disadvantages and hardships. Comparing UC enrollment at each campus before and after the policy's implementation, we estimate that Holistic Review has increased URG enrollment at UC by at most 6%, though the true effect is likely lower (since some of those applicants would have otherwise enrolled at another UC campus).

Each of these race-blind policies has substantially contributed to UC's URG student body, but their URG enrollment impact is far smaller than that of UC's historical affirmative action program. This topic brief sheds light on two important lessons from Proposition 209. First, university admissions policies targeting disadvantaged applicants are effective, in the sense that their termination is costly to their previous beneficiaries. Second, race-blind admissions policies can significantly increase universities' URG populations, but to a substantially lesser extent than race-based affirmative action.
HISTORY AND BACKGROUND

Race-based affirmative action was practiced in University of California admissions since at least 1978, when UC Berkeley’s course catalog advertised “Affirmative Action Counseling” that “helped [URG] students realize their potential and achieve academic success at Berkeley”. Increasing controversy around the policy came to a head in July 1995, when it was first prohibited by the UC Regents and then banned by a voter proposition to the same effect that passed in November 1996. While SP-1, the original Regents policy, was rescinded in 2001, Proposition 209 has prohibited UC from “discriminating against, or granting preferential treatment to, any individual or group on the basis of race, sex, color, ethnicity, or national origin in the operation” since the Fall 1998 admission cohort.

In the 2000s and 2010s, a number of admissions policies have been implemented by various UC campuses intending to increase the undergraduate student body’s socioeconomic diversity and widen UC’s pipeline to economic mobility. At least two of those policies, the 2001-2011 Eligibility in the Local Context program and holistic review, have had the partial consequence of substantially increasing the number of UC students from under-represented groups (defined in this study as Latino/a, Black, or Native American students).

First, UC introduced the Eligibility in the Local Context program in 2001 as a partial replacement for its previous affirmative action programs. Students at participating California high schools were guaranteed admission to at least one UC campus if their grades were in the top four percent of their graduating class. Months prior to UC’s application deadline, ELC-eligible students received a letter signed by the University of California’s President informing them of their eligibility, along with the guarantee of admission to UC (but no information about which of UC’s nine undergraduate campuses they would be able to attend). Advocates for the ELC program argued that the program would improve access to the UC system for students at lower-performing and rural high schools, making them "locally-eligible" for UC admission despite their lower standardized test scores than students at higher-performing schools.

Second, in 2002 all UC campuses switched their 30-year-old admissions process from a two-tiered system—in which at least half of students were enrolled on academic criteria, with only the remainder evaluated on other criteria like special skills or hardships—to “Comprehensive Review”, in which campuses “evaluate students’ academic achievements in light of the opportunities available to them”. UC Berkeley went a step further, implementing “holistic review”, in which “a trained evaluator or set of evaluators craft a single score for the applicant based upon a combination of the criteria” and “no single factor plays a deciding role in how an applicant is evaluated”. By de-emphasizing quantitative academic measures relative to applicants’ special talents and disadvantages, Holistic review could plausibly change the ethnic composition of admitted students despite being race-blind. UCLA implemented holistic review in 2007, with San Diego and Irvine joining in 2011 and Davis and Santa Cruz in 2012.

This study proceeds by estimating how the end of affirmative action impacted URG students who applied to UC, before turning to the degree to which these two alternative UC admissions policies have partially replaced affirmative action in promoting URG enrollment at the University of California.

THE IMPACT OF PROPOSITION 209

As has been shown previously, the elimination of affirmative action caused large immediate changes to the likelihood of UC admission and enrollment for URG applicants. In order to estimate this impact, we compare the likelihood of admission of URG and non-URG applicants with similar measured academic preparation (SAT I and II scores, high school GPA and course difficulty) in the two years before and after the implementation of California’s ban on affirmative action, estimating the change in URG applicants’ likelihood of admission relative to similar non-URG peers. See the Technical Appendix for details about our estimation strategy.

Table 1 shows that URG applicants to UC Berkeley were the most impacted, becoming almost 31 percentage points less likely to earn admission after Berkeley ended its affirmative action admissions program. In other words, among the pool of URG applicants to UC Berkeley in 1998, more than a quarter
of them would have been admitted to Berkeley under affirmative action admissions, but were instead rejected as a result of Prop. 209. URG applicants to the UCLA, Davis, and San Diego campuses were rejected with about 20 percentage points greater frequency, while those to the Santa Barbara, Riverside, Santa Cruz, and Irvine campuses were closer to five percentage points less likely to earn admission. Across all applicants to any UC campus, URG applicants’ likelihood of being admitted to at least one UC campus fell by 7 percentage points relative to similar non-URG applicants. For more information about Prop. 209’s impact on UC admission, including the baseline likelihood of admission at each campus, take a look at the UC Information Center or Grodsky and Kurlaender’s book on the subject.

How many URG applicants were excluded from the University of California as a result of Prop. 209? The simplest estimate just takes the difference in the proportion of freshmen URG students at each UC campus before (1995-1997) and after (1998-2000) Prop. 209 and multiplying by the average post-209 enrollment. Summed across campuses—Berkeley lost about 376 URG students per year, but some may have attended Riverside instead, which net gained about 84 URG students annually—this suggests that at least 700 URG students per year didn’t enroll at UC as a result of Prop. 209 in 1998-2000, implying that affirmative action increased the UC URG student population by at least 12 percent. In fact, the true effect is likely higher, since some URG applicants may have been dissuaded from applying to UC even before 1998 as a result of charged political rhetoric at the time; an alternative estimation technique described in the Technical Appendix implies that affirmative action may have been responsible for closer to 14 percent of UC’s URG enrollment.

As a result of these lower likelihoods of admission, and perhaps also because of the psychological toll taken by the passage of Prop. 209, URG applicants also became less likely to enroll at UC campuses. Once again, Berkeley faced the largest drop in URG enrollment, with a 10 percentage point decline in URG applicants’ likelihood of enrollment. While enrollment also declines at the UCLA and San Diego campuses, it actually increases (on average) across the other campuses. Many of the applicants rejected from the campuses with the largest admissions declines were able to attend other UC campuses instead, leading to a net increase in URG applicants’ likelihood of enrolling at those campuses. Nevertheless, there was a large net decline in URG UC applicants’ likelihood of enrolling at any UC campus, with about 6 percent of applicants either enrolling outside UC or not attending any postsecondary institution at all.

What was the impact of this decline in URG UC enrollment, particularly at the Berkeley and UCLA campuses, on the long-run outcomes of those URG applicants? In order to answer this question, we link our 1990s UC application records to two massive external datasets. First, we link each applicant to the National Student Clearinghouse (NSC), a comprehensive database that includes information about nearly all Bachelor’s and graduate degrees awarded in the United States. These linked data allow us to observe whether the URG applicants ever earned postsecondary degrees, at UC or elsewhere. For more details on the completeness and match quality of the NSC, see the Data Appendix.

Table 1: The Impact of Prop. 209 on the Admission and Enrollment Rates of URG Applicants to UC

<table>
<thead>
<tr>
<th>Δ (%)</th>
<th>UCB</th>
<th>UCLA</th>
<th>UCSD</th>
<th>UCD</th>
<th>UCSB</th>
<th>UCI</th>
<th>UCSC</th>
<th>UCR</th>
<th>Any</th>
</tr>
</thead>
<tbody>
<tr>
<td>Admit</td>
<td>-25.6</td>
<td>-18.1</td>
<td>-21.8</td>
<td>-17.1</td>
<td>-6.5</td>
<td>-3.8</td>
<td>-4.8</td>
<td>-2.0</td>
<td>-6.8</td>
</tr>
<tr>
<td>Enroll</td>
<td>-10.1</td>
<td>-6.6</td>
<td>-3.5</td>
<td>1.6</td>
<td>1.9</td>
<td>3.1</td>
<td>3.2</td>
<td>3.5</td>
<td>-5.6</td>
</tr>
</tbody>
</table>

Note: This table shows the change in admission or enrollment likelihoods for URG applicants to each UC campus—and for applicants to any UC campus—after the elimination of affirmative action in 1998, in comparison to non-URG applicants with similar observed academic preparedness (SAT scores and HS grades). Statistics are estimated by linear regression across 1995-1999 UC applicants; see Technical Appendix for details. Estimated standard errors, not shown, range from
Using the same estimation strategy as above, comparing URG and non-URG applicants who have similar measurable academic preparedness in the two years before and after UC’s affirmative action ban, we estimate the impact of the ban on URG applicants’ likelihood of earning a college degree (within six years of applying to UC) and of ever earning a graduate degree (before age 37). Our results are presented in Table 2. We find that the end of affirmative action leads to a 1.4 percentage point decline in all URG applicants’ likelihood of earning a Bachelor’s degree within six years, likely as a result of their decreased likelihood of enrolling at UC campuses (and the Berkeley and UCLA campuses in particular) after graduating high school. They also become less likely to earn graduate degrees (by 1.4 percentage points), especially law degrees, which are encouraged by the UC campuses and tend to correspond to higher postgraduate earnings. The effects are strongest for applicants from the bottom tercile of the UC Academic Index, who were most likely to no longer be able to enroll at UC campuses following Prop. 209. In combination, these results suggest that Prop. 209 led to substantial educational losses for URG UC applicants.

The second database we link to our student application records is an earnings database maintained by the California Employment Development Department (EDD), which allows us to measure annual earnings for any UC applicant employed in the state of California. Details on the EDD data are also available in the data appendix.

How did the postgraduate earnings of URG and non-URG UC applicants compare following the end of affirmative action? Figure 1 shows Prop. 209’s relative impact on URG applicants’ average log California earnings over the 6 to 18 years after they apply to UC, when most of them are 24 to 36 years old. The plot shows that from 6 to 13 years after the UC application, URG applicants were substantially negatively affected by Prop. 209; the scale can be interpreted as URG applicants earning 2-4 percent lower annual wages,

Table 2: The Impact of Prop. 209 on the Degree Attainment of URG Applicants to UC

<table>
<thead>
<tr>
<th>Change (%)</th>
<th>Six-Year BA/BS</th>
<th>Earn Grad. Degree</th>
<th>Earn Law Degree</th>
</tr>
</thead>
<tbody>
<tr>
<td>Overall</td>
<td>-1.42</td>
<td>-1.39</td>
<td>-0.51</td>
</tr>
<tr>
<td>(standard error)</td>
<td>(0.40)</td>
<td>(0.57)</td>
<td>(0.26)</td>
</tr>
<tr>
<td>Bottom Tercile</td>
<td>-1.72</td>
<td>-1.98</td>
<td>-0.26</td>
</tr>
<tr>
<td>(s.e.)</td>
<td>(0.87)</td>
<td>(0.79)</td>
<td>(0.22)</td>
</tr>
</tbody>
</table>

Note: This table shows the change the likelihood of earning an undergraduate or graduate degree for URG UC applicants after the elimination of affirmative action in 1998, in comparison to non-URG applicants with similar observed academic preparedness (SAT scores and high school grades). Statistics are estimated by linear regression across 1995-1999 UC applicants; see Appendix for details. Estimated standard errors in parentheses.

Figure 1: Effect of Prop. 209 on URG Applicants’ California Log Earnings, 6-18 Years after UC Application

Note: Each point represents the change in average URG UC applicants’ earnings in California (relative to non-URG earnings) a given number of years after UC application. The bars show 95% confidence intervals. See Technical Appendix for estimation details.
about $1,500 per year, on average across all URG applicants to UC compared to academically-similar non-URG applicants. Importantly, this is the average across all URG applicants, not just those whose admissions decisions were altered by the end of affirmative action; in fact, we estimate that the latter group faced earnings losses closer to $20,000 per year in their late 20s as a result of being rejected from UC campuses.4

Once the previous UC applicants reach their 30s, the estimates of affirmative action’s impact on wages becomes noisier. In order to quantify the labor market consequences of Prop. 209 even in URG applicants’ mid-30s, we estimate the change in their likelihood of earning at least $75,000 (approximately the family income in California), at least $100,000, and at least $150,000 in each year after applying to UC. These relatively high wages are earned by many UC graduates, but we find that URG applicants become much less likely to earn them after affirmative action decreased their likelihood of selective UC enrollment. Figure 2 shows that as early as 8 years after applying to UC (when applicants are about 25 years old), all URG UC applicants had become about 1 percentage point less likely to be earning a $75,000 wage in California, and that result persists even 10 years later. By 12 years out, many UC graduates have earnings over $100,000, and by 14 years out many earn more than $150,000, but significantly fewer URG applicants to UC were able to achieve those earnings as a result of the end of affirmative action.

The Results Appendix presents additional estimates of the impact of Prop. 209 on applicants’ labor market outcomes, showing that these earnings declines were very substantial for impacted URG applicants and that they were most concentrated among URG applicants from the bottom tercile of Academic Indices, suggesting that their decreased likelihood of attending any University of California campus—most attended community colleges instead—was very costly in the two decades after.

In sum, these results suggest that race-based affirmative action was very successful in providing economic opportunity to hundreds of annual URG applicants to the University of California, and that those applicants suffered after the passage of Prop. 209. Since 1998, UC has implemented a number of admissions programs targeting a variety of disadvantaged applicants, some of which have had the effect of increasing URG enrollment. We now turn to estimates of the URG enrollment magnitudes of two of those programs.

**URG ENROLLMENT FROM ELIGIBILITY IN THE LOCAL CONTEXT**

When Eligibility in the Local Context began in 2001, it was expected to increase the UC enrollment of disadvantaged applicants in two ways: by encouraging new applications and by increasing the admissions likelihood of applicants who would otherwise be rejected. Application encouragement was supposed to

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**Figure 2: Effect of Prop. 209 on URG Applicants’ CA Earnings by Income Thresholds**

- (a) Earnings > $75,000
- (b) Earnings > $100,000
- (c) Earnings > $150,000

Note: Each point represents the change in average URG UC applicants’ likelihood of earning the respective threshold ($75,000, $100,000, or $150,000) in California (relative to non-URG earnings) a given number of years after UC application. The bars show 95% confidence intervals. See Technical Appendix for estimation details.
occur because ELC-eligible students were informed that their GPAs were in the top four percent of the graduating class—and that they were therefore guaranteed admission to at least one UC campus—months prior to the UC application deadline, giving potential applicants plenty of time to send in an application. While this may have been successful among some student populations, an academic companion paper to this report provides evidence suggesting that new URG applications were not encouraged by the ELC program. As a result, here we focus on the number of students encouraged to enroll at UC directly as a result of their admission under the ELC program.

ELC functioned by guaranteeing admission to students who had high school GPAs above their high school’s fourth percentile threshold. As a result, one natural way to estimate how many URG students enrolled at UC because of ELC but would not have done so without the program is to track what proportion of students at each high school below the fourth percentile threshold enrolled at UC and use that model to predict what proportion of students above the threshold would have enrolled if they weren’t guaranteed admission by the ELC program.

Figure 3 visualizes this technique. Consider Panel (a), on the left, which shows the proportion of 2003-2011 California-resident freshman URG UC applicants who choose to enroll at UC by their distance to their high school’s fourth percentile ELC threshold. The black dot just below the threshold, for example, shows that about 47 percent of applicants with GPAs just below their high school’s threshold—applicants who very nearly were ELC eligible, which would have increased their likelihood of being admitted to many UC campuses—ended up enrolling at UC. Meanwhile, the dot just above the threshold shows that more than 55 percent of students who just made it into their high school’s fourth percentile—and were thus ELC eligible—enrolled at a UC campus. This suggests that URG UC applicants very near their high school’s ELC threshold became around 8 percentage points more likely to enroll at UC if they were deemed ELC-eligible.

**Figure 3: Estimated URG Enrollment Impact of the 2001-2011 Eligibility in the Local Context Program**

(a) Linear Extrapolation  
(b) Quadratic Extrapolation

Note: The x-axis shows the distance between each student and their high school’s fourth percentile ELC threshold; students below 0 are ineligible for ELC, while those above are eligible. The y-axis shows the proportion of students who enroll at UC. Each black dot is the binned average proportion of students who enrolled at UC with that GPA. The thin lines are linear or quadratic fits to the data on either side of the threshold; the thick line extrapolates the below-threshold line above the threshold. The estimated impact is the number of students between the two lines, plus or minus a 95% confidence interval. For more information, see the Technical Appendix.
The thin blue lines in Panel (a) fit lines to the black dots, estimating a linear trend in UC enrollment across URG applicants to UC. The thick blue line, then, extrapolates the below-threshold fit line to the above-threshold applicants. The difference between the two above-threshold lines can be interpreted as an estimate of the number of applicants who only enrolled at UC as a result of ELC; if there hadn’t been any ELC program, then UC enrollment likelihoods would probably have looked more like the thick line than the thin. Count up the number of applicants between the two—the number of additional enrollees implied by an increase from the thick line to the thin—and you have an estimate of the annual number of new URG UC enrollees at UC as a result of the ELC program.

The linear fit provides an enrollment estimate of 88 new URG enrollees per year at UC as a result of ELC. But comparing the black dots to the fit line presents a challenge: the fit line doesn’t seem to fit the curvature of applicants’ enrollment patterns very well, since the increase in the proportion of UC enrollees appears to be flattening out just before the threshold. Maybe the counterfactual enrollment estimate—the thick blue line—shouldn’t slope so steeply upwards? An alternative estimate is provided in Panel (b), where the enrollment fit lines are estimated as quadratic instead of linear. Now the counterfactual enrollment likelihoods appear to decline at high GPA levels; perhaps high-GPA students would be admitted to better alternative universities, decreasing their UC enrollment? This fit line leads to an estimate of ELC’s impact on UC enrollment of 335 URG students per year.

In the end, it seems most appropriate to choose a number in between. The counterfactual slope is almost surely not as steep as it is shown in Panel (a), but it’s also unlikely to decrease as fast as it’s shown to in Panel (b). We conclude that **ELC increased URG enrollment by about 250 students per year between 2001 and 2011**, an in-between estimate verified by an alternative estimation strategy detailed in the academic companion paper to this brief. This implies that **ELC increased UC URG enrollment by about 3.5 percent**, a non-negligible increase that nevertheless was far smaller than UC’s previous affirmative action policy.6

The ELC program was nominally expanded in 2012 to cover nine percent of graduates from each California high school instead of four percent, but changing campus-specific admissions policies appear to have

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**Figure 4: Estimated Impact of the Adoption of Holistic Review on URG Applicants**

(a) Likelihood of URG Admission

(b) Likelihood of URG Enrollment

Note: Estimates of the annual impact of Holistic Review implementation on the likelihood of URG applicants’ admission and enrollment at implementing campuses, relative to non-URG applicants and compared to 3-4 years prior to HR implementation. Bars show 95% confidence intervals. See the Technical Appendix for estimation details.
largely nullified the program’s effect in increasing URG admissions. Rather than analyzing that program in detail, we turn to a more recently-implemented program that also has important implications for URG enrollment at UC.

URG ENROLLMENT FROM HOLISTIC REVIEW

As discussed in the Background section above, six UC campuses have implemented holistic review (HR) in their undergraduate admissions since 2002, when Berkeley became the first campus to do so. While Proposition 209 continues to prohibit the specific use of race in UC admissions, HR is designed in part to identify other aspects of disadvantage faced by UC applicants, which likely disproportionately effect URG applicants. In order to estimate the increased number of URG enrollees that result from the implementation of HR, we compare URG applicants’ admission and enrollment rates in the years before and after each implementation, conditional on the other characteristics listed in their applications. Details on the estimation strategy are in the Technical Appendix.

The estimates of the impact of HR are shown in Figure 4. Each estimate shows the differential likelihood of URG applicants to be admitted to HR campuses some number of years before or after implementation, compared to their differential likelihood of admission 3-4 years prior to implementation. For example, one year before implementing HR, URG applicants are near-exactly as likely to be admitted to the campus as they had been a few years earlier, as would be expected; after all, the program had not yet taken effect. The year that HR is implemented (Year 0), however, their differential likelihood of admission shoots up, becoming almost three percentage points more likely to earn admission. Over the following years, URG applicants’ likelihood of admission persistently stays 1-2 percentage points above its pre-HR level, compared to academically-similar non-URG applicants.

URG applicants’ increase in likelihood of admission translates into an increased likelihood that they actually enroll at the implementing campus. Panel (b) of Figure 4 shows that this relative enrollment increase is consistently about one percentage point across all URG applicants. In other words, about one percent more URG applicants at a campus that implements HR end up enrolling at that campus (compared with before the campus had implemented HR, and relative to academically-similar non-URG applicants).

How does this change in URG enrollment behavior, motivated by campuses’ HR admissions policies, translate into increased aggregate URG enrollment? Figure 5 uses the enrollment estimates from Figure 4 to estimate the total annual increase of URG students at HR-implementing campuses as a result of holistic review. The estimates jump in 2007 and 2011-2012 because those are the years in which new campuses implemented HR, and are slowly growing over time as a result of UC’s consistent growth with the population of California. In 2017, more than 800 first-year URG students at six UC campuses were unlikely to have enrolled at UC if not for the HR program, suggesting that holistic review is responsible for an increase in UC URG enrollment of at most 5.9 percent. However, many of those students would otherwise have enrolled at other UC campuses, implying that...
even if all nine undergraduate UC campuses implemented HR, the total increase in URG enrollment would likely be less than 6 percentage points.

CONCLUSION

Proposition 209 instigated a dramatic change in UC admissions policy, with URG enrollment at the Berkeley and UCLA campuses immediately falling by more than 60 percent and systemwide URG enrollment falling by at least 12 percent. URG high school graduates faced substantial long-run declines in educational and employment outcomes as a result of these changes. Among California URG high school graduates who applied to the University of California, the end of affirmative action led to a decreased likelihood of earning a college degree within six years, a decreased likelihood of ever earning a graduate degree, and long-run declines in average wages and the likelihood of earning high wages by California standards.

In the 20 years since the end of its affirmative action program, UC has implemented a number of race-neutral admissions policies that increase disadvantaged applicants’ likelihood of being admitted to various UC campuses. At least two of those policies—the 2001-2011 Eligibility in the Local Context Program and holistic review—have differentially benefitted URG applicants, though to a considerably lesser extent than affirmative action itself. ELC increased URG enrollment by about 250 students per year (and also provided substantial educational and employment benefits to participants, as we’ve shown previously), while holistic review is currently increasing UC URG enrollment by a maximum of 800 students per year (though many of those would otherwise have attended other UC campuses). For comparison, affirmative action increased net URG enrollment by at least 700 students per year in the mid-1990s, though this is likely an underestimate, and in the intervening years total UC enrollment has nearly doubled. Twenty years later, the legacy of Proposition 209 remains strong at the University of California.
DATA APPENDIX

All UC application data are derived from the UC Corporate Student Warehouse.

National Student Clearinghouse
The data we use for this analysis come from the National Student Clearinghouse’s StudentTracker database, which contains enrollment and graduation information across nearly all US two- and four-year colleges and universities. In particular, it contains semestery enrollment records (including institution name and location) and graduation records (including institution name and location, degrees and majors earned, and year of graduation) for all postsecondary degree-granting institutions that accept federal Title IV funding, a near-universal set. The UC Office of the President links these records to the UC applications by first and last name, middle initial, and birth date (allowing for common nicknames and typos). NSC reports that about 4 percent of records are censored due to student- or institution-requested blocks for privacy concerns (NSCRC, 2017), and that the only public university in California with censorship greater than 10 percent is UC Berkeley (where we observe enrollment directly).

Most public universities were reporting semestery enrollment by 1996, for which reason we censor application records from earlier years, but many community colleges did not report enrollment until around 1999-2001, and some private universities were not reporting until the late 2000s. Enrollment coverage has been greater than 90 percent in California since 2003, the earliest year used in the ELC portion of the study, and is near-comprehensive for public institutions (Dynarski et al., 2015). Nevertheless, 1990s applicants whose enrollment is not observed in the NSC are likely to have been enrolled at community colleges, and some non-observed applicants in the ELC era may be have been enrolled at small private universities. Nearly all institutions have been reporting degree attainments since the mid-1990s, so substantial censorship of graduation outcomes is unlikely.

Employment Development Department
Quarterly earnings data are from the California Employment Development Department, which maintains records for unemployment insurance administration. The earnings data were linked by reported social security numbers, and are missing for workers outside California and federal government employees. Annual wages are measured as the sum of quarterly wages in that year. About 55 percent of applicants in the sample have positive earnings in each of 6-9 years after high school graduation. The most recent earnings available are the last quarter of 2017, allowing estimation of wages up to 18 years following 1999, the last year in the 1995-1999 period of applications used to study affirmative action.

TECHNICAL APPENDIX

This technical appendix discusses three estimation methods used in the report above: (1) difference-in-difference estimation of the effect of Proposition 209 on URG outcomes among UC applicants; (2) the estimation technique adopted to estimate the degree to which URG application discouragement leads to an underestimate of the impact of affirmative action on URG enrollment declines at UC; and (3) the event study model used to estimate the impact of Holistic Review on URG admissions/enrollment, along with the summed UC enrollment estimate.

Difference-in-Difference Estimation of Proposition 209
In order to estimate the impact of the end of affirmative action on URG enrollment, I estimate a simple difference-in-difference model of application outcomes on applicants’ URG status. First, I estimate campus-specific models of application, admission, and enrollment to estimate how affirmative action practically influenced applicant behavior:

\[ Y_{icy} = \alpha_h + \beta_{1c} NoAA_{iy} + \beta_{2c} URM_{iy} + \beta_{3c}\text{NoAA}_{iy} \cdot URM_{iy} + \gamma_{cy} X_{iy} \cdot \text{NoAA}_{iy} + \epsilon_{icy} \]

where \( Y_{icy} \) indicates whether individual \( i \) applied to UC campus \( c \) in year \( y \), was admitted to that campus, or ultimately enrolled at that campus. The sample is restricted to 1996-1999, two years before and after the 1998 end of AA; no UC campus implemented any other large-scale change in their admissions processes in this period. The application model is estimated by OLS over the full population of UC freshman California-resident applicants, while the admission model is restricted to applicants to the campus; enrollment models are estimated with restrictions to either applicants and admits to the campus. All OLS estimation in this study is conducted using the felm function in the lfe R package, version 2.8-2. Each campus and outcome is estimated independently. The coefficients of interest are \( \beta_{2c} \), the degree to which URG students were more likely to have \( Y_{icy} \) under the AA regime, and \( \beta_{3c} \), the change in that likelihood after AA ended (indicated by NoAA_{iy}).
The key difference between this model and similar estimates elsewhere in the literature is the inclusion of high school fixed effects $\alpha_{c,s}$, which absorb considerable spurious cross-school application variation, in combination with a detailed set of individual-level controls $X_{i,y}$ interacted with $N_{oAA,y}$. $X_{i,y}$ includes SAT score, high school GPA, SAT II Writing score, SAT II Math score, an indicator for submitting a score from the more-difficult SAT II Math 2 exam, first-generation status, and gender. These controls can be generally summarized as students’ observed academic preparation. Standard errors are robust.

**Estimate of URG enrollment changes given URG high school students’ application behavior**

I use two methods to estimate the change in URG enrollment as a result of AA. First, I measure:

\[ \left( \frac{\%URM_{c,1995-1997} - \%URM_{c,1998-2000}}{3} \right) \times \frac{ENR_{c,1998-2000}}{3} \]

the difference in the percent of 1995-1997 enrolling students at campus $c$ who were URG and that same percent in 1998-2000, scaled by the average number of enrolling students at that campus in 1998-2000 $ENR_{c,1998-2000}$.

However, the statistic measured above would only reflect the true change URG enrollment `caused' by AA if there were no other differences in the UC campuses’ admissions procedures between the early and late years. In fact, two other things may have changed: steadily growing applicant pools may have led the campuses to become more selective, which in turn could heterogeneously impact URG applicants, and the composition of URG applicants may have changed in response to the end of AA, with less-academically-prepared URG students possibly discouraged from UC application.

As an alternative estimate of AA’s impact on UC student enrollment, I estimate:

\[
\left( \frac{URG_{c,1995} - \bar{E}[URG_{c,1995}|N_{oAA_{1995}} = 0] - R_{G,c,1995} - \bar{E}[R_{G,c,1995}|N_{oAA_{1995}} = 0]}{3 \times ENR_{c,1998-2000}} \right)
\]

where $URG_{c,1995}$ is the number of URG enrollees at $c$ in 1995, $\bar{E}[URG_{c,1995}|N_{oAA_{1995}} = 0]$ is the sum of 1995 URG applicants’ predicted values from the difference-in-difference affirmative action equation with enrollment as the outcome, setting $N_{oAA_{y}}$ to 1 (that is, as if affirmative action were not implemented in 1995), and $R_{G}$ is the complement of $URG$. This statistic estimates the greater degree to which the end of AA changes the expected enrollment of URG students relative to non-URG students, scaled by 1998-2000 enrollment. On the one hand, this method allows for differences in applicant pool by fixed applicants at the 1995 distribution, prior to the passage of SP-1 and Proposition 209, and allows for changes over time in campus selectivity by differencing out admissions differences for RG applicants. On the other hand, this method adds statistical noise from linear regressions with relatively-low $R^2$ values (bootstrapped standard errors are not yet reported) and may represent a lower bound on URG enrollment declines attributable to AA, because ending AA would also lead to a (relatively-small) increase in the second term of the equation as $RG$ students `crowd in' to UC, such that the second term would be downwardly-biased as a measure of changing selectivity.

**Event study model of Holistic Review**

Six UC campuses have implemented holistic review (HR): Berkeley in 2002, UCLA in 2007, San Diego and Irvine in 2011, and Davis and Santa Cruz in 2012. I estimate the effect of HR implementation on the likelihood of URG applicants’ admission and enrollment using a diff-in-diff event study design, comparing outcomes for URG applicants relative to non-URG applicants:

\[ Y_{tyc} = \alpha_{h,c} + \sum_{i \in [−5,4]} \beta_i I_{HR_{c,y+i}} + \gamma SAT_{c} \times GPA_{c} + \text{delta}_{yci} + \zeta_{c,g_i,\epsilon_i} + \eta_{y,\epsilon_i} + \theta_{A,h,c,\epsilon_i} + \epsilon_{yc} \]

with coefficient of interest $\beta_i$ measuring URG students’ differential outcome $y + i$ years after $c$ implemented HR in $HR_{c}$. The sample is restricted to 1997-2017 California-resident freshman Fall applicants. The fixed effects $\zeta_{c,g_i,\epsilon_i}$, $\eta_{y,\epsilon_i}$, $\theta_{A,h,c,\epsilon_i}$ capture variation by gender $g_i$, URG status $u_t$, and whether the applicant is in the top four percent of her high school class (and thus ELC-eligible) $\epsilon_i$, with the last of the fixed effects capturing variation by gender, ethnicity, and whether the applicant is in the top four percent of her high school class for applicants to Absorbing UC campuses between 2001 and 2011 $E_{c}$, in order to absorb the effect of the pre-reform ELC program. Note that the UC campuses’ all simultaneously switching to a “Comprehensive Review” policy from a more algorithmic admissions policy in 2002 is absorbed by the $\zeta_{c,g_i,\epsilon_i}$ fixed effect. Four and three years prior to HR implementation are omitted as the comparison
period, and the $\beta_{-5}$ and $\beta_4$ effects are defined to absorb all prior and subsequent years, respectively, and are not presented. Standard errors are clustered by applicant.

In order to aggregate these effects to estimate the total increased URG enrollment resulting from HR implementation, it is important to account for the direct crowd-out effect of HR on non-URG enrollment. As a result, a one percentage point increase in the likelihood of a URG applicant’s enrollment relative to a non-URG applicant’s likelihood of enrollment as a result of HR implementation corresponds mechanically to a $\nu_{URM_{cy}}$ percent increase in the non-relative likelihood of a URG applicant’s enrollment as a result of HR implementation, where $\nu_{URM_{cy}}$ is the percent of applicants to $c$ in $y$ who were not URG. The percent of non-URG applicants to HR-implemented campuses in the sample period was 67.1. I also assume that the effect of HR had stabilized two years after implementation, and estimate the mean of $\beta_2$ and $\beta_3$, 0.92 percentage points, as the annual relative URG enrollment advantage to HR implementation.

RESULTS APPENDIX

This section includes additional estimates of the impact of Proposition 209 on labor market outcomes for URG applicants to UC. Figure 1 shows that estimated wages of URG applicants declined after Proposition 209. One possible reason for this decline would be that the number of workers in California declined, possibly the result of applicants leaving California for their postsecondary education as a result of rejections from public California universities. However, estimates of the percent of URG applicants employed in California are consistently statistically indistinguishable from 0.

This suggests that the primary effect is driven by lower earnings in California as a result of lower wages being paid to young URG workers with less-selective postsecondary education.

The graphs above, and those presented in the topic brief, all show “reduced-form” results, averaging outcomes across all URG applicants to UC. However, not all URG applicants were impacted by Prop. 209; some were accepted to UC anyway, and others were unlikely to attend UC even under its affirmative action policy. In fact, the size of the impacted group is observed: it is the percent of URG applicants who would have been accepted to UC, but were not as a result of Prop. 209. Taking this into account, we could attribute the full reduced-form effect of Proposition 209 to that group, and ask what UC admission would have been “worth” to that group in terms of future employment outcomes. Formally, we estimate the following two-stage least squares instrumental variable regression:

$$
Y_{iyc} = \alpha_h + \beta_1 N_{NoAA_y} + \beta_2 URM_i + \beta_3 AdmUC_{iy} * URM_i + \gamma_{xy} X_{iy} * NoAA_y + \epsilon_{iyc}
$$

$$
AdmUC_{iy} = \alpha_h + \beta_1 N_{NoAA_y} + \beta_2 URM_i + \beta_3 NoAA_y * URM_i + \gamma_{xy} X_{iy} * NoAA_y + \epsilon_{iyc}
$$

Where $AdmUC_{iy}$ indicates an applicant's admission to at least one UC campus. These estimates could be biased upwards if URG applicants' enrollment also differentially changes (towards less-selective enrollment) as a result of changes in likelihood of admission at CSU campuses, though there is substantially less selectivity variation (and much stronger tendency to enroll at the nearest campus) in the CSU system.

These estimates suggest that being rejected from UC as a result of Prop. 209 cost URG applicants as much as $20,000 per year in earnings in their late 20s.
Once again, changes in California employment are statistically insignificant, though there is some evidence that admission to UC increases likelihood of employment in California.

Similar estimates by the three income thresholds presented in Figure 2—$75,000, $100,000, and $150,000—show that UC admission increased URG applicants likelihood of earning at least $75,000 by as much as 20% in their early 30s, and increased their likelihood of earning $150,000 per year by as much as 10% in their mid-30s. These results did not materialize as a result of Prop. 209, suggesting large labor market costs as a result of that policy. The results also look fairly similar, though are somewhat attenuated, when the sample is restricted to UC enrollees:

Which URG applicants faced those costs most substantially? Our last set of analysis breaks up the applicant pool into three groups by tercile of Academic Index, a combination of SAT score and high school GPA that characterizes applicants’ measured preparedness coming out of high school. We then estimate the income threshold models for each tercile separately. Here are the estimates for the $75,000 cutoff by lowest Academic Index tercile:
The first tercile faced the brunt of the negative labor market shock. This is despite their likelihood of California employment substantially increasing, probably as a result of reduced migration out of the state:

Only the bottom tercile seems to have faced declining total average California earnings:

But the middle and top terciles also face declines in average log earnings at various points:

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2 See Atkinson and Pelfrey (2004) for a more complete account of the motivation behind these policies.

3 A public-facing description of Comprehensive and Holistic Review is available from UC.

4 See the Results Appendix for these and more estimates.


6 This estimate may be upward-biased as a result of URG crowd-out from the ELC program, which is not estimated here, though the degree of URG crowd-out is likely small. On the other hand, it could be downward-biased if ELC did in fact increase UC application rates among URG high school graduates.

7 See “Diversity in University Admissions: Affirmative Action, Percent Plans, and Holistic Review”.

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