**EXECUTIVE SUMMARY**

Does the University of California have high graduation rates and alumni earnings because of (1) its adept admission and recruitment of academically talented and accomplished applicants, or (2) because of the high quality of the educational experience that it provides? In this topic brief, we test the importance of the latter channel by studying the *causal* effect of UC enrollment on students’ postgraduate outcomes.

In 2001, the University of California implemented the Eligibility in the Local Context (ELC) program, which provided an admissions advantage to California high school students in the top four percent of their class by GPA. The program provides a useful setting in which the value of UC enrollment can be tested. By comparing students just above and below their high school’s ELC eligibility threshold—that is, comparing a group of highly similar students, only some of whom (because of their slightly-higher GPAs) were guaranteed UC admission by the ELC program—we isolate statistical estimates answering three questions:

I. How did the ELC program change the enrollment behavior of ELC-eligible high school students?

II. What kind of students, socioeconomically and demographically, were affected by ELC eligibility?

III. Were the enrollment changes brought about by ELC beneficial to those high school students?

The ELC program was substantially revamped in 2012, but this topic brief analyzes the impact of the original policy, which was in place from 2001 to 2011. The brief shows that ELC pulled 8 percent of just-eligible students into three “Absorbing” UC campuses: San Diego, Davis, and Irvine. The plurality of these students were absorbed from the Cal State University (CSU) system, though some came from three other UC campuses (Merced, Riverside, and Santa Cruz) and California community colleges.

About 43 percent of the students pulled into the three Absorbing UC campuses were from under-represented minorities (URM), increasing the proportion of URM students at those campuses. These students were also more likely to come from both rural and public high schools than their Absorbing UC peers, improving the campuses’ geographic diversity, and more than 80 percent of them came from families that earned less than the average student at those campuses.

This report presents evidence that enrolling at an absorbing UC campus:

1. Increased students’ **likelihood of earning a college degree** within five years by 22 percent, and by 31 percent among students from the bottom SAT quartile of high schools;

2. Decreased **one in two students’ time-to-degree by a full year**, without deterring students from majors with high individual and social returns (like STEM) on average; and

3. Provided bottom-quartile applicants a **net increase in their expected early-career income by 13 percent**, along with a decrease in their expected likelihood of unemployment by 1.3 percentage points. Their observed early-career wages also appear higher, especially among URM students.

In short, the 2001-2011 ELC program not only succeeded in benefitting eligible students—especially URM students—from across the state of California, but also illuminated UC’s value to enrolled students. UC’s San Diego, Davis, and Irvine campuses are shown to substantially increase and speed up students’ likelihood of graduation compared to those students’ alternative enrollment options, leading to meaningful improvements in those students’ expected and observed employment outcomes.
OVERVIEW

The University of California system has a higher graduation rate—84.4 percent in six years for the 2011 entering cohort—than most other public universities in the Association of American Universities (AAU), and UC undergraduate alumni have substantially-higher median earnings in the years following graduation than the average California college graduate. But the UC system is also selective, admitting only 63.1 percent of freshman applicants (compared to 84.3 percent at the California State University system) and only available to the top 15.9 percent of California public high-school graduates. Are University of California students more likely to graduate and earn high wages because of the services—academic, professional, and support—provided by UC, or because those students were already intelligent young adults destined to success with or without a UC education? The challenge in answering this question, even with vast knowledge about UC student outcomes, is to identify plausible counterfactual outcomes for those students: What would those students’ outcomes have looked like if they hadn’t attended UC?

In this topic brief, we describe one group of UC graduates for which a reasonable counterfactual group is readily available, and compare these two groups in order to estimate the value of UC admission. We focus on students who were practically guaranteed admission to three UC campuses—UC San Diego, UC Davis, and UC Irvine—by an administrative policy, comparing them to similar peers who were not guaranteed admission. We observe where those students ended up going to college, what fields they chose to study, and whether (and when) they earned college degrees. Because the only difference between the two sets of students was the former’s guaranteed admissions prospect, we can conclude that any differences in their eventual outcomes are a result of the increased likelihood of the former group to attend the three University of California campuses.

Our findings show that admission to the three UC campuses listed above was very beneficial for admitted students. If they chose to accept the admissions offer, their likelihood of earning a bachelor’s degree (from any university) within five years increased by about 22 percentage points. Admitted students from lower-quartile high schools, who thus had fewer alternative college options, were even more impacted: those admitted students became 31 percentage points more likely to graduate college in five years if they attended UC. Moreover, attending the University of California substantially decreased the time it took graduates to earn their college degree (by more than one year for every two graduates). Students’ major choice was broadly unaffected; there is no evidence, for example, that students pulled into UC campuses become any less likely to major in engineering or broader STEM fields on average, though some less-prepared students became more likely to earn Humanities and Social Science degrees instead. The resulting net effect appears to substantially improve students’ expected early-career employment outcomes, and our limited data on postgraduate early-career wages suggest that UC students—especially URM students—earned higher wages in the years immediately following college graduation. In general, the evidence below suggests that the causal impact of UC is very beneficial for California youth, and—given the substantial positive spillovers of higher education—for the state of California as a whole.

BACKGROUND: ELIGIBILITY IN THE LOCAL CONTEXT

In 2001, the University of California implemented the Eligibility in the Local Context program. Students at participating California high schools—which by 2003 included 96 percent of public high schools and 80 percent of private high schools—were guaranteed admission to at least one UC campus if they were in the top four percent of their class. Class rank was determined directly by UC, without regard for high school administrators’ own rankings; high schools submitted the top 12.5 percent of their students’ transcripts to UCOP’s Admissions Operations team, who calculated UC-specific ‘ELC GPAs’ using certain eligibility-relevant courses (omitting physical education and many non-college-prep elective courses) and directly informed students whose ELC GPA satisfied the four percent threshold. Below-threshold students with satisfactory grades were also contacted and encouraged to apply to UC, but their admission was not guaranteed.
While ‘ELC-eligible’ students with GPAs above their high school’s threshold were guaranteed admission to at least one UC campus, the campuses were given autonomy to make their own admissions decisions. Figure 1 shows how each campus responded to students’ ELC designation, averaged between 2003 and 2011. Panels (a) and (b) includes labels to aid interpretation. Along the x-axis is each students’ distance from their high school’s ELC GPA threshold; along the y-axis is the average likelihood of students’ admission to each campus. Each black dot represents the proportion of students with that ELC GPA who were admitted to the given campus, and the blue line averages the dots into a trend line by ELC GPA. For example, about 25 percent of students with an ELC GPA 0.1 points below their high school’s threshold were admitted to Berkeley, while almost 60 percent were admitted to UC San Diego and more than 90 percent admitted to Riverside. As should be expected, applicants with higher high school GPAs are more likely to be admitted to any university, so these trend lines are mostly upward-sloping.

Figure 1: UC admissions likelihood by ELC GPA above and below each high school’s four percent threshold, by campus
The figure shows that UC Berkeley and UCLA did not significantly consider ELC eligibility in their admissions decisions; students just above the threshold were no more likely to be admitted than students just below the threshold, apart from the continuously-increasing likelihood of admission arising independently from higher-GPA students being admitted with greater likelihood. Similarly, the figure shows that UC Riverside, UC Merced, and UC Santa Cruz did not differentially admit students who were ELC-eligible; the ELC program was already very selective, only including the top four percent of each high schools' students, and those students were already extremely likely (greater than 90 percent) to be admitted to those campuses. Indeed, the fact that these UC campuses near-uniformly accepted students just below high schools' ELC threshold suggests that the ELC program did not ultimately increase students' likelihood of admission.

Figure 2: UC enrollment likelihood by ELC GPA above and below each high school's four percent threshold, by campus

(a) UC Berkeley

(b) UC Davis

(c) UCLA

(d) UC Riverside

(e) UC San Diego

(f) UC Santa Cruz

(g) UC Santa Barbara

(h) UC Irvine

(i) UC Merced
to be admitted to at least one UC campus; nearly all ELC-eligible students would have been admitted to some UC campus anyway, by virtue of their strong high school GPAs.

The other campuses tell a different story. UC San Diego considered ELC-eligibility as one factor in their admissions decision, and was more likely to admit ELC-eligible students; applicants with ELC GPAs just above the threshold were about 13 percentage points more likely to be admitted than those with ELC GPAs just below the threshold. The effect of ELC eligibility was largest at UC Davis and UC Irvine, which both accepted nearly all ELC-eligible students, increasing just-eligible students’ likelihood of admission by as much as 20 percentage points. Figure 1 shows that the practical impact of ELC eligibility was the guaranteed—or increased likelihood of—admission to the UC campuses at Davis, Irvine, and San Diego. Since these campuses see an expansion in admission (and, as shown below, enrollment) resulting from the ELC eligibility, for the purpose of this study these schools are called the ‘Absorbing’ UC campuses.

The same pattern can be seen in applicants’ likelihood of enrolling at each of the nine undergraduate UC campuses. Figure 2 shows that while students with higher ELC GPAs were more likely to enroll at UC Berkeley and UCLA, ELC eligibility had no effect on their enrollment decision; students just above the eligibility threshold follow the same trend as those below the threshold. These schools are thus designated as the ‘Unimpacted’ UC campuses, with student enrollment seemingly unaffected by ELC eligibility. Enrollment at the Absorbing UC campuses increases among ELC-eligible applicants by anywhere from 1 to 4 percentage points; admitting students through the ELC program meaningfully increases the number of students who enroll at those universities, especially UC Davis and San Diego. The opposite is true for UC Santa Cruz, Riverside, and Merced, which we designate the ‘Dispersing’ campuses: enrollment slightly declines for borderline students (that is, for students just above the eligibility threshold relative to those just below the threshold), who become more likely to attend the Absorbing UC campuses.

Notably, the increase in enrollment at Absorbing UC campuses exceeds the enrollment decline at Dispersing UC campuses. This suggests a dual effect of the ELC program: eligibility shifted some applicants between UC campuses—say, from UC Riverside to UC San Diego—but it also shifted some applicants into UC from outside the system altogether. In order to make these changes more transparent, consider an arbitrary California high school. In a given year, the top four percent of that high school (as ranked by UC’s ELC GPA) are informed of their ELC eligibility. Take two students: the ELC-eligible student with the lowest ELC GPA and the non-eligible student with the highest ELC GPA. The location of the cutoff is arbitrary from the perspective of either student, since it depends on the GPAs of all of the other students at the high school; there are no meaningful differences between these two chosen students except that one of them just barely earned ELC eligibility while the other barely didn’t.

Figure 3 on the right visualizes these two students in a diagram: one just above their high school’s threshold, the other just below. If there were no ELC program, we would expect these students to enroll in similar universities; after all, their only dissimilarity is a tiny difference in GPA, likely a single grade. In order to see how the ELC program changes students’ college attendance decisions, then, we could compare the average choices of these so-called ‘borderline’ students, which in fact looked quite different from each other because of the ELC program.

The left pie chart in Figure 4 shows the enrollment of the highest-GPA non-eligible student at every high school in California between 2003 and 2011. These are all very good students, with higher grades than almost 96 percent of their peers, but their grades weren’t quite high enough for ELC eligibility. Just over half of those students enrolled at a University of California campus immediately after graduating high school, with another

Figure 3: ELC Eligibility
Note: Each circle represents one student at a high school

4.6
Highest-GPA student

4.5

4.4
Lowest-GPA ELC-eligible student

4.3

GPA Threshold

Highest-GPA ELC-ineligible student

4.3

Figure 4: UC Enrollment of the Highest-GPA ELC Ineligible and Eligible Students
15 percent enrolling at either a Cal State University or a California Community College. Ten percent enrolled at private California universities, while eleven percent enrolled at out-of-state universities. Seven percent of these students did not enroll at any postsecondary institution in the year following graduation, including students who entered the workforce directly as well as those who took gap years before attending college.8

Figure 4’s right pie chart, on the other hand, shows the actual enrollment decisions made by the lowest-GPA ELC-eligible students at California high schools, again selecting a single student from each school in each year. Asterisks denote statistically-significant differences between the two. The proportion of students who attended UC Berkeley and UCLA was unchanged between the two groups, but enrollment at the Absorbing UC campuses (Davis, Irvine, and San Diego) increased dramatically, from 25 percent of non-eligible students to 32 percent of eligible students. Where were these students coming from? The chart shows that they were mostly switching into Absorbing UC campuses from three alternatives—Cal State universities, the Dispersing UC campuses (Merced, Riverside, and Santa Cruz), and community colleges—in order of decreasing importance. A small number of students (around 1 percent) were pulled from non-enrollment, and would not have attended any university or college after graduating high school if not for the ELC program. The program did not change students’ likelihood of enrolling at private or out-of-state universities, suggesting that UC’s low in-state tuition was a substantial factor in enabling UC attendance for this large group of students.

An important feature of the ELC program was its differential impact at different high schools across the state of California. ELC likely had little impact in the state’s top high schools, since the top four percent of students (by ELC GPA) at those schools would probably have been admitted to most UC campuses whether or not they were guaranteed admission by the program. The lower the high school’s average SAT scores, the more impactful the program, since even top students at those schools would be decreasingly likely to be otherwise admitted to Absorbing UC campuses. In order to measure the impact of the ELC program on the students who it impacted the most—that is, the students who were least likely to be otherwise admitted to Absorbing UC campuses, but were guaranteed admission due to their ELC eligibility—we rank California’s high schools each year by the average SAT score of students near the ELC eligibility cutoff and split the school-year cohorts into quartiles, estimating effects for each quartile separately. As expected, students at bottom-SAT-quartile high schools were far more impacted by ELC eligibility than those at top-quartile schools. Becoming ELC-eligible at the bottom quartile of high schools, for example, made students 40 percent more likely to be admitted to UC Davis, while those in the top quartile were only 6 percent more likely to be admitted.
Student's admissions eligibility through the Eligibility in the Local Context program increased their likelihood of enrollment at UC Davis, Irvine, and San Diego, pulling them out of Dispersing UC campuses, the CSUs, and California Community Colleges. But were these students actually made better-off by ELC eligibility? In particular, what was the impact of attending these Absorbing UC campuses on ELC-eligible students? In order to estimate this effect—which provides information about the general impact of these Absorbing UC campuses, not only for ELC-eligible students—we employ a standard regression discontinuity design, comparing outcomes for students on either side of the ELC eligibility threshold. Details about this empirical methodology are available in the Technical Appendix.9

FINDINGS I: HOW DID ELC-ELIGIBLE STUDENTS’ ENROLLMENT CHANGE?

We begin by obtaining statistical estimates of the enrollment results presented above.10 As shown in Table 1, ELC eligibility increases borderline students’ likelihood of attending one of the University of California campuses by 5.3 percentage points (with a 95 percent confidence interval between 3.5 and 7.1 percent).11 The likelihood of attending an Absorbing UC campus increases by 7.8 percentage points. Almost a third of those students would have otherwise attended Dispersing UC campuses. University attendance increased 1.5 percentage points for ELC-eligible students; 1.0 percent of eligible students switched from two-year community colleges to the four-year UC system, while 0.6 percent of them switched from non-enrollment into UC. The remaining 4.4 percent of students were pulled from other universities, mostly from the CSU system.

These effects are much larger for ELC-eligible students from the bottom SAT quartile of California high schools. ELC eligibility was extremely impactful at those schools: Absorbing UC attendance increased by 18.8 percentage points, with almost half of those students (7.1 percentage points) pulled from the CSU system. Community college enrollment and Dispersing UC enrollment also dropped precipitously (by 3.6 and 5.1 percentage points, respectively). The impact at the highest-quartile of high schools, on the other hand, was much smaller: Absorbing UC campus enrollment increased only 1.2 percentage points, and none of the effects were statistically different from 0.

Table 1: Enrollment outcomes at the ELC threshold, overall and by subgroup

<table>
<thead>
<tr>
<th>Outcome</th>
<th>Overall</th>
<th>Lowest SAT Quartile</th>
<th>URM</th>
</tr>
</thead>
<tbody>
<tr>
<td>UC Enrollment</td>
<td>5.3%</td>
<td>12.3%</td>
<td>9.3%</td>
</tr>
<tr>
<td>(St. Err.)</td>
<td>(0.9)**</td>
<td>(2.1)**</td>
<td>(2.0)**</td>
</tr>
<tr>
<td>Absorbing UC Enr.</td>
<td>7.8%</td>
<td>18.8%</td>
<td>13.3%</td>
</tr>
<tr>
<td></td>
<td>(1.0)**</td>
<td>(2.2)**</td>
<td>(2.1)**</td>
</tr>
<tr>
<td>CC Enrollment</td>
<td>-1.0%</td>
<td>-3.6%</td>
<td>-0.9%</td>
</tr>
<tr>
<td></td>
<td>(0.3)**</td>
<td>(1.1)**</td>
<td>(1.0)</td>
</tr>
<tr>
<td>Univ. Enrollment</td>
<td>1.5%</td>
<td>4.2%</td>
<td>1.9%</td>
</tr>
<tr>
<td></td>
<td>(0.6)**</td>
<td>(1.6)**</td>
<td>(1.4)</td>
</tr>
</tbody>
</table>

Table 1 shows the estimated impact of ELC eligibility on on-the-fence applicants’ likelihood of enrolling at various postsecondary institutions (denoted in the first column). The third and fourth columns restrict the sample to students from the bottom quartile of California high schools by SAT score or to URM students. Standard errors are in parentheses, and the asterisks denote * 10 percent, ** 5 percent, or *** 1 percent statistical significance differing from 0. See the Technical Appendix for more information about how these coefficients were estimated.
FINDINGS II: WHICH ELC-ELIGIBLE STUDENTS WERE PULLED INTO UC?

The ELC program was intended to diversify the University of California’s admission pool, pulling top students from every corner of the state into its Absorbing campuses. Was it successful in doing so? Table 2 presents the estimated characteristics of ELC “complier” students: that is, students who would not have attended an Absorbing UC campus if they hadn’t been ELC-eligible, but who did so because of their ELC eligibility. For the statistical methodology used to calculate these “complier estimates”, see the Appendix. The second column of the table shows the actual averages for each characteristic among California-resident freshman enrollees at the Absorbing UC campuses during the years of the ELC program.

The first row of Table 2 shows that over 40 percent of students who attended Absorbing UC campuses as a result of the ELC program were from under-represented minority (URM) groups, nearly all of whom were Hispanic. This means that these students were more than twice as likely to be URM as their eventual California-resident peers at the Absorbing UC campuses (20.1% of whom were URM), substantially increasing the ethnic diversity of those campuses. Moreover, 8.0 percent of these students attended rural California high schools (more than 50% higher than their peers), implying that ELC also succeeded in increasing the geographic diversity of the Absorbing UC campuses.\(^{12}\)

ELC compliers also tended to come from lower-income households than their Absorbing UC campus peers, with reported families earnings of about $78,000 per year. This income level also means that most ELC compliers would have received substantial financial aid, and likely paid very low (or no) tuition. In total, 68 percent of ELC compliers came from households who earned less than the $85,000 average of other students at Absorbing UC campuses.\(^{13}\) The compliers were much more likely to attend public high schools—98 percent of them did so—and much more likely to attend California high schools in the bottom 25 percent of schools by SAT score (56% versus 20%).

In short, ELC was successful in increasing the diversity of UC’s student body, primarily pulling students from underrepresented minorities, students from lower-income backgrounds, and students from California’s rural and lower-average-SAT-score high schools into premier public research universities.

FINDINGS III: WAS UC ENROLLMENT BENEFICIAL FOR ELC-ELIGIBLE STUDENTS?

Finally, Table 3 shows the main results of our analysis.\(^{14}\) We focus on three outcomes of interest for university students: graduation rate, time to degree, and postgraduate earnings. Our first main finding is that ELC eligibility alone increased students’ likelihood of graduating any four-year university (within

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**Table 2: Characteristics of ELC compliers compared to Absorbing UC averages**

<table>
<thead>
<tr>
<th></th>
<th>ELC Compliers</th>
<th>Absorbing UC Avg.</th>
</tr>
</thead>
<tbody>
<tr>
<td>URM</td>
<td>43.2%</td>
<td>20.1%</td>
</tr>
<tr>
<td>(St. Err.)</td>
<td>(7.2)</td>
<td></td>
</tr>
<tr>
<td>SAT Score</td>
<td>1542</td>
<td>1796</td>
</tr>
<tr>
<td>(46)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Family Inc.</td>
<td>$68,200</td>
<td>$87,300</td>
</tr>
<tr>
<td>(12,300)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Public HS</td>
<td>98.2%</td>
<td>89.1%</td>
</tr>
<tr>
<td>(4.1)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bottom SAT Quart. HS</td>
<td>55.9%</td>
<td>20.0%</td>
</tr>
<tr>
<td>(7.5)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Table 2 shows estimates of the demographic, economic, and geographic characteristics of ELC compliers, the ELC-eligible students pulled into Absorbing UC campuses. The third column shows statistics describing all California-resident students at the Absorbing campuses, not just the ELC compliers. Standard errors are in parentheses, and the asterisks denote * 10 percent, ** 5 percent, or *** 1 percent statistical significance differing from 0. See the Technical Appendix for more information about how these coefficients were estimated.
five years of graduating high school) by 1.5 percentage points, even though only 7.8 percent of eligible students were actually pulled into an Absorbing UC campus. By implication, students who were pulled into Absorbing UC campuses by the ELC program became 22 percent more likely to earn a college degree within five years, suggesting that the Absorbing UC campuses were extremely successful in helping borderline students earn Bachelor's degrees. This finding provides strong evidence that the Absorbing UC campuses don’t just have high graduation rates because of their admissions selectivity; even for students who are quasi-randomly admitted and enroll at those campuses, their likelihood of graduating college increases dramatically (compared to their outside options).

The second and third columns show the effect of ELC eligibility on students from bottom-SAT-quartile high schools and URM students. The graduation effect is even larger for these two groups of students, who would otherwise be more likely to attend non-UC universities; Absorbing UC campuses provide an even larger positive graduation effect for students from high schools with lower average SAT scores and for URM students, increasing those students likelihood of graduating college within five years by 31 and 33 percent, respectively.

The second row of Table 3 shows that being pulled into an Absorbing UC campus by ELC decreases students’ average time to their degree by 0.53 years, or by one year for every two students, among students who had finished their degrees within six years. Again, these effects are magnified for students from high schools with lower average SAT scores and for URM students; URM students at Absorbing UC campuses finished their undergraduate degree by almost a full year faster than they would have elsewhere.

Finally, we use two methods to test the longer-run employment implications of attending Absorbing UC campuses. Since the ELC program was implemented relatively recently, it is difficult to evaluate its labor

### Table 3: Graduation and employment outcomes at the ELC threshold, overall and by subgroup

<table>
<thead>
<tr>
<th>Outcome</th>
<th>Overall</th>
<th>Lowest SAT Quartile</th>
<th>URM</th>
</tr>
</thead>
<tbody>
<tr>
<td>Univ. Graduation (5 Yr.)</td>
<td>22.4%</td>
<td>30.9%</td>
<td>33.1%</td>
</tr>
<tr>
<td>(St. Err.)</td>
<td>(11.5)**</td>
<td>(12.4)**</td>
<td>(17.0)*</td>
</tr>
<tr>
<td>Years to Degree</td>
<td>-0.53</td>
<td>-0.72</td>
<td>-0.86</td>
</tr>
<tr>
<td>(Expected Earnings (%))</td>
<td>13.0%</td>
<td>19.3%</td>
<td>25.0%</td>
</tr>
<tr>
<td>(Age 30, estimated in the US Census ACS)</td>
<td>(8.4)</td>
<td>(8.5)**</td>
<td>(14.1)*</td>
</tr>
<tr>
<td>Early-Career Earnings ($)</td>
<td>$11,400</td>
<td>$15,000</td>
<td>$32,000</td>
</tr>
<tr>
<td>(Age 25, California employment)</td>
<td>(12,100)</td>
<td>(8,500)*</td>
<td>(16,400)*</td>
</tr>
</tbody>
</table>

Table 3 shows the estimated per-complier impact of ELC eligibility on on-the-fence applicants’ graduation and employment outcomes after enrolling at an Absorbing UC campus. The third and fourth columns restrict the sample to students from the bottom quartile of California high schools by SAT score or to URM students. The third row, ‘Expected Earnings’, shows the (positive or negative) percent change in expected earnings given degrees, majors, and gender, as estimated in the American Community Survey (in hundreds of log points; see Bleemer 2018 for more details). Normalized standard errors (assuming no error in the 7.8% proportion of compliers) are in parentheses, and the asterisks denote * 10 percent, ** 5 percent, or *** 1 percent statistical significance differing from 0. See the Technical Appendix for more information about how these coefficients were estimated.
market implications, since early-career wages (earned prior to age 31 or 32) are not very indicative of an individual’s long-run likely earnings. Instead, we approximate ELC’s labor market impact using (1) an estimated proxy for students’ ‘expected’ early-career earnings, and (2) students’ early-career wages, observed by linking to California state employment records.

The third row estimates the early-career earnings impact of ELC’s affect on students pulled into Absorbing UC campuses. We use the massive American Community Survey to predict the average expected income of each ELC applicant using three pieces of information: their degrees five years after high school graduation, their major (if they have a college degree), and their gender. Then we test whether ELC-eligible students had higher expected incomes than their ineligible peers. Because ELC eligibility substantially increases students’ likelihood of graduation, without much change to their choice of major, we find that ELC eligibility increases students’ expected income by 13 percent, on top of a 1.9 percent decreased likelihood of unemployment.

Finally, the fourth row links students to the state of California’s Employment Development Department (EDD) earnings database, which includes earnings for all employees in the state (except for federal government employees). About 55 percent of students near their high schools’ ELC thresholds appear in the EDD database seven years after graduating high school (when they’re around age 25), with the rest either not working, employed outside of California, or working for the federal government.

The fourth row of Table 3 shows that ELC-eligible students from bottom-quartile high schools have substantially higher annual earnings—by $15,000 per year—seven years after high school graduation (when they’re about 25 years old). URM applicants received even larger wage increases, averaging more than $30,000 per year, after being pulled into Absorbing UC campuses. Because ELC-eligible students graduated so recently, earnings more than seven years following high school graduation are not yet observed for most ELC compliers, but these results suggest substantial earnings benefits arising from UC enrollment under the ELC program in comparison with near-identical students who enrolled at other universities.

CONCLUSION

Does the University of California have high graduation rates and alumni earnings because of (1) its adept admission and recruitment of academically talented and accomplished applicants, or (2) because of the high quality of the educational experience that it provides? In this topic brief, we present rigorous evidence for the latter hypothesis. Using the University’s Eligibility in the Local Context (ELC) program between 2003 and 2011, we construct a plausible counterfactual group of students to those who attended a number of so-called “Absorbing” UC campuses through the program. The ELC program pulled students from a number of other universities (and a few UC campuses) into UC San Diego, UC Davis, and UC Irvine, mostly from three alternative choices: the CSU system, California community colleges, and three “Dispersing” UC campuses (Riverside, Santa Cruz, and Merced). We find that the students who attended the Absorbing UC campuses were significantly and substantially more likely to graduate—and tended to earn their degrees much faster—than their quasi-randomly-designated peers. These changes correspond to substantially-improved expected employment outcomes for these students, whose increased likelihood of earning a college degree implies an expected increase in early-career income by 13 percent.

In general, we find strong evidence of UC’s success as a university that successfully promotes college graduation without compromising on the quality of that education. We will return to these questions, and this research design, in the future, studying both the economic and non-economic public and social benefits of the UC education.
BIBLIOGRAPHY


TECHNICAL APPENDIX

This technical appendix discusses three estimation methods used in the report above: (1) the support vector machine used to estimate each high school’s eligibility threshold, (2) the local linear regressions used to estimate regression discontinuity effects around each high school’s eligibility threshold, and (3) the two-stage least-squares estimates of complier effects used to measure which students attended Absorbing UC campuses as a result of the ELC policy.

1. Threshold Estimation

We do not directly observe the high-schools-specific ELC GPA threshold used to determine students’ ELC eligibility, instead only observing the ELC eligibility status (and ELC GPA) of those students who choose to apply to at least one UC campus. Estimating a support vector machine independently for each California high school and year, we take the mean of all possible thresholds that minimize a linear penalty function across the school’s UC applicants as that school’s ELC GPA threshold in that year. A small number of students (1.0% Type 1 Error and 1.9% Type 2 Error among those within 0.3 GPA points of their high school’s estimated threshold) are misclassified by the threshold, apparently due to overriding decisions based on students’ high school transcripts. In practice, these estimated thresholds yield sharp discontinuities in UC campuses’ admissions decisions, as displayed in Figure 1.

2. Regression Discontinuity Estimation

This study primarily implements standard fuzzy regression discontinuity estimation, using a similar strategy to that implemented by Niu and Tienda (2009) in studying the Texas Top Ten program. Following Calonico, Cattaneo, and Titiunik (2014), we estimate local linear regressions of the form:

\[ Y_{it} = \alpha + ELC_{it} \beta + GPA_{it} \gamma \left( \frac{ELC_{it}}{0} \right) + X_{it}^T \delta + \epsilon_{it} \]

where \( Y_{it} \) is an outcome for student \( i \) who applied to the UC system in year \( t \), \( ELC_{it} \) is an indicator for \( i \) having an ELC GPA above their high school’s ELC threshold in \( t \), \( GPA_{it} \) is the difference between \( i \)’s ELC GPA and the ELC threshold at their high school in \( t \), and \( X_{it}^T \) denotes a set of control variables included to absorb spurious variation (including year dummies, gender-ethnicity interacted dummies, and a fifth-order polynomial of SAT score). Because the threshold is (slightly) fuzzy (since the ELC thresholds are themselves estimated), the estimated \( \beta \) coefficients are then normalized by the change in likelihood of true ELC eligibility. Bandwidths for the local linear regressions are selected optimally and bias-corrected standard errors are estimated robustly, each again following Calonico, Cattaneo, and Titiunik (2014) and implemented using the \textit{rdrobust} package in R (Calonico, Cattaneo, and Titiunik 2015). Because ELC GPAs are
highly discontinuous at 4.00 (see Bleemer 2018, Figure 2), high schools with ELC thresholds between 3.96 and 4.00 are omitted from all analysis.

3. Complier Analysis

The primary enrollment effect of the ELC program is to increase enrollment at the three Absorbing UC campuses (Davis, San Diego, and Irvine). To estimate the characteristics of these ELC ‘compliers’—that is, applicants who would not have attended an Absorbing UC campus without ELC eligibility, but who do so if eligible—we implement the following two-stage least-squares estimator (due to Abadie 2002):

\[
\text{Absorb}_{it} = \alpha_i' + \text{ELC}_{it}\beta' + f(\text{GPA}_{it})\gamma' (\text{ELC}_{it} 0 0 1 - \text{ELC}_{it}) + \epsilon_{it}
\]

where \( Z_i \) is a permanent characteristic of \( i \), \( \text{Absorb}_{it} \) indicates Absorbing UC enrollment, and \( \alpha_i \) are year dummies.

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2 Graduation: See the 2017 UC Accountability Report, figure 3.1.1. Earnings: compares 2015 wages of UC graduates from the Employment Development Department with 2015 wages of young college graduates reported in the American Community Survey; published in Douglass, John and Zachary Bleemer, 2018: Approaching a Tipping Point? A History and Prospectus of Funding for the University of California.
4 Because ELC participation was somewhat lower in the first two years of its implementation, all data presented in this topic brief cover the years 2003-2011, when the program was implemented in full force. See http://www.ucop.edu/news/cr/factsheet.pdf for more information.
5 These percentages are conditional on students’ applying to each respective campus.
6 UC Santa Barbara is a middle case. ELC-eligible students were guaranteed admission to UCSB, but nearly all of them would have been admitted even without eligibility, leading to only a small increase in admissions likelihood at the threshold. Since it does not fit neatly into either of the other cases, we largely omit UC Santa Barbara from discussion in this brief, though we include it as an Absorbing UC campus in our analysis (since it may have absorbed a small number of ELC-eligible students).
7 As elsewhere in this report, the universe of high school students in our sample are only those who applied to at least one University of California campus during their senior year. As a result, the borderline student described here is actually the non-eligible student with the highest ELC GPA among those students who sent an application to UC.
8 Enrollment and degree data at non-UC institutions are collected by matching first, middle, and last names and dates of birth to the National Student Clearinghouse (NSC) StudentTracker database. Students who do not enroll at UC and do not appear in the NSC database are assumed to not enroll in a postsecondary institution.
9 Regression discontinuity designs are a popular quasi-experimental research set-up in which a population is divided into ‘treatment’ and ‘control’ groups, as in an actual regression, by a near-random discontinuous selection criterion. For a canonical example in the academic literature, see van der Klaauw (2002). Because the population is divided as-if-randomly, any differences in outcomes between the two groups can be attributed to the ‘treatment’ faced by one of the groups, as opposed to any prior differences between the two. In our case, ‘treatment’ is defined as ELC eligibility, with a high-school-level administrative discontinuity (the eligibility threshold) near-randomly dividing students close to the threshold into treatment and control groups. Comparisons of outcomes between, say, 4th and 5th percentile students, then—only the former of which are guaranteed admission—can be attributed directly to the ELC treatment. For more detail, see the technical appendix.
10 Because our data only cover UC applicants, evidence of non-balanced demographic characteristics estimated using our discontinuity regressions would suggest that students’ likelihood of applying to UC after being informed of their ELC eligibility varies by observable characteristics, which may alternatively explain differences in outcomes. While the proportion of Asian-American applicants falls 2.3 percentage points at the ELC threshold (implying that other ethnic groups are somewhat more responsive in applying to UC), there are no meaningful differences in student gender or SAT score around the threshold. The difference in family income across the threshold is statistically significant at the 10 percent level ($4,360.00 higher across the threshold, s.e. $2293.20), though the proportion of students with non-missing incomes (0.0%, s.e. 1.0), a proxy for high-income students, does not differ across the threshold. Moreover, this positive difference in incomes is driven by students from the top quartile of high schools by SAT score, who are unlikely to actually comply with ELC; it appears that higher-income students at top California high schools took ELC eligibility as an opportunity to apply to UC campuses as “backup” options, but did not actually
change their enrollment behavior as a result. The income effects by quartile were first $-1,798.70 ($2,108.90), $4,486.80 ($3,900.30), $3,736.60 (4,278.30), and fourth $11,255.00 (6,634.7); the effects for missing income were -0.1% (1.1), -1.4% (1.8), 0.9% (1.9), and -3.0% (2.5), robust bias-corrected standard errors in parentheses. For URM students: -3,869.2 (2,535.6) and -1.1 (1.3).

11 The asterisks in Table 1 refer to the statistical significance of the displayed estimate, relative to the null hypothesis of a null effect. * for 10%, ** for 5%, and *** for 1% significance. For more information about estimation procedures, see the appendix.

12 Rural high schools are defined as those outside any "urbanized area" as defined by the National Center for Education Statistics. See https://nces.ed.gov/surveys/ruraled/definitions.asp, where NCES’s definitions are available.

13 60.0 percent of observed incomes of ELC compliers were below Absorbing UC campuses’ median observed income of $65,000. This difference was driven by ELC compliers in the first quartile of high schools by SAT score; compliers’ incomes were $49,100 (6,600) and $99,300 (21,600), $147,700 (93,300), and $63,300 (252,400) for the first through fourth quartiles, with standard errors in parentheses. Only 12.6 percent of ELC compliers failed to report incomes to UC relative to 18.4 percent among their Absorbing UC campus peers, providing further evidence of their lower-income status (though the difference is statistically-insignificant).

14 See endnote 9.

15 See Chetty et al (2017), Figure II.

16 For more information on how we predict students’ early-career incomes using the American Community Survey, see Bleemer (2018). Because the 2003-2011 ELC program was implemented so recently, it is difficult to estimate its impact on students’ actual wages, since the students have only been in the labor market for a few years. When we use our regression discontinuity technique to estimate the effect of ELC eligibility on early-career observed wages, as observed in linked UC-applicant data from the California Employment Development Department (which excludes out-of-state employment and federal government employment), we do not find evidence of any change in early-career wages, between 6 and 10 years following high school graduation.

17 There were statistically significant differences in the likelihood with which first-quartile ELC-eligible students appeared in the EDD database in years six, seven, and nine—the reduced-form estimates (and standard errors) of the differences overall and for male, female, URM and first/second SAT quartile high schools six years out were 0.22 (1.04), 0.78 (1.53), -0.05 (1.31), 2.67 (2.16), 4.11 (1.94), and -1.25 (2.25), while for seven years out they were 0.11 (0.84), 0.26 (1.37), -0.36 (1.19), -0.81 (1.96), 3.25 (1.8), and 0.39 (2.03) and nine years out were 0.68 (0.88), 1.62 (1.18), 0.48 (0.98), 1.55 (1.69), 3.68 (1.90), and -0.03 (1.89)—but there were no such differences eight years out: -0.4 (0.88), 0.53 (1.29), -0.16 (1.09), -2.66 (2.01), 2.01 (2.17), and 0.21 (1.63).

18 EDD earnings are observed for members of all cohorts six years following high school graduation, but one cohort drops out with each subsequent year of earnings data (since the earnings have not yet been received). The sample sizes of observations for each of the four years-after were 96,011, 82,190, 70,613, and 59,389. Using the same categories as in endnote 9, the effect of wages 6 years out (in hundredths of log points) was 1.06 (2.66), 0.44 (4.69), 0.98 (3.33), 8.73 (5.93), 7.63 (5.59), and -4.02 (5.69); 7 years out 3.85 (2.76), 0.64 (5.64), 2.95 (3.23), 6.61 (5.47), 3.03 (4.41), and 11.38 (4.36); 8 years out 4.49 (3.06), 1.03 (5.56), 4.01 (3.32), 10.59 (4.83), 8.66 (6.36), 8.35 (6.13); and 9 years out -2.37 (2.7), -12.1 (6.05), -0.02 (3.37), 2.93 (5.73), -4.05 (5.60), and -1.35 (6.75).