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# Demystifying College Costs: How Nudges Can and Can't Help

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## Demystifying College Costs: How Nudges Can and Can't Help

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**Abstract:** As US college costs continue to rise, governments and institutions have quadrupled financial aid. Yet, the administrative process of receiving financial aid remains complex, raising costs for families and deterring students from enrolling. In two large-scale field experiments (N= 265,570), we test the impact of nudging high-school seniors in California to register for State scholarships. We find that simplifying communication and affirming belonging each significantly increase registrations, by 9 per cent and 11 per cent respectively. Yet, these nudges do not impact the final step of the financial aid process -- receiving the scholarship. In contrast, a simplified letter that affirms belonging while also making comparable cost calculations more salient significantly impacts college choice, increasing enrollment in the lowest-net-cost option by 10.4 per cent. Our findings suggest that different nudges are likely to address different types of administrative burdens, and their combination may be the most effective way to shift educational outcomes.

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## Introduction

Fewer than two-thirds of US high school seniors enroll in college immediately after completing high school (NCHEMS, n.d.). This share is much lower for students from low-income families, for those whose parents did not go to college, and for those from underrepresented minority groups (Wilbur and Roscigno, 2016). Indeed, the shares of high-achieving, low-income students who go to college are lower than the equivalent shares of lower-achieving students from higher income families (Fox, Connolly and Snyder, 2005).

Cost is a key barrier to college access. Rapidly increasing college tuition affects both the decision to go to college in the first place, leaving some students out of college completely, and college *selection*, leading some students to enroll at less selective options with lower tuition -- sometimes referred to as the “sticker price” -- despite evidence that attending more selective schools is good for long-run outcomes (Cohodes and Goodman, 2014; Dynarski *et al.*, 2021). In response, policymakers have made significant investments in financial aid programs that aim to increase college access, particularly at selective, four-year institutions. Total grant aid to students is roughly \$125 billion per year, quadruple (in real terms) its level a decade ago (Seltzer, 2017; Trends in Student Aid, 2017). Nevertheless, aid programs fail to reach all students who would benefit from them. One analysis found that more than 20 percent of California community college students who were eligible for a Pell Grant did not receive it, leaving almost \$130 million in financial aid on the table in a single semester (Martorell and Friedmann, 2018). Another study finds that students who do not fill out the FAFSA leave \$24 billion on the table (Kofoed, 2017).

One potential explanation for this gap in take-up is the burdens associated with applying for and receiving financial aid, a process that is notoriously complex and difficult to navigate. Herd and Moynihan (2019) provide a useful framework for understanding these and other types of administrative barriers. First, there may be learning costs: students may not take-up financial aid for which they are eligible because they may incorrectly calculate the value of going to college or the true cost of going to college for them. The latter is, in itself, a function of how aid is presented. Second, there may be compliance costs: even for students who understand the rules and availability of aid, the numerous actions required to qualify for financial aid may create too many hurdles. Students must complete FAFSA forms, much more complex than annual income tax returns (The Hamilton Project, 2007); comply with requests to verify their financial and family details; and collect and combine grant and loan aid offers from federal, state, and institutional sources that are not coordinated. Last, students may face psychological barriers when making high-stakes college decisions that limit their ability to take up aid, and have long-lasting effects for their lives.

Behavioral science evidence is mixed on whether outreach efforts to reduce such barriers and increase take-up could impact student decision-making. Some studies have found that direct assistance with aid applications (Bettinger *et al.*, 2012) and a clear guarantee about the specific amounts of aid availability (Dynarski *et al.*, 2018) have meaningful effects on college enrollment decisions, even without changes in the underlying structure of aid. It is noteworthy that both of these successful interventions tackle compliance burdens as well as informational barriers. In the former, direct assistance is provided in filling out the FAFSA; in the latter, a guarantee of a full

“scholarship” eliminates the need to go through the complex aid process. On the other hand, recent attempts to scale up successful “nudge” interventions aimed at encouraging financial aid applications have shown no impact on take-up (Bird *et al.*, 2019), enrollment (Hyman, 2019), or school choice (Gurantz *et al.*, 2019).

We contribute to this literature by explicitly testing whether nudges that reduce psychological and learning barriers can impact decision-making on three margins -- accessing financial aid, going to college, and choosing which school to attend -- in a setting where we can test these barriers head-to-head and in combination. Unlike other studies, we can directly compare the effects of interventions that reframe college aid with those providing concrete and personalized cost information, and can estimate effects both on the outcomes being nudged and on longer term outcomes of greater long-run importance. This allows us to assess the relative importance of different barriers at one key stage in the process and to understand whether previous evidence that nudges fail (Bird *et al.*, 2019; Gurantz *et al.*, 2019; Hyman, 2019) reflects the specific nudges that were selected or represents a limit to what is possible through outreach campaigns.

In collaboration with the California Student Aid Commission (CSAC), which administers state-level financial aid for California (known as the “Cal Grant”), we ran two large-scale field experiments (total N=265,570) that aimed to increase knowledge and take-up of financial aid. The Cal Grant both lowers the cost of college and changes the relative cost of different school options, and past studies have found impacts on enrollment, college completion, and earnings (Kane, 2003; Bettinger *et al.*, 2019).

We test several variants of notification letters sent to eligible students, in the middle of their senior years of high school. We find striking evidence that simplified, behaviorally informed letters lead to increased Cal Grant account registration rates. In year 1, simplifying the letter and adding language emphasizing social belonging significantly increases registrations by 9 per cent and 11 per cent (5.5 and 6.8 percentage points), respectively, compared to the baseline letter. In year 2, we find that both a belonging message and a social norm message have small positive, albeit statistically insignificant, effects on account registration, of 1.6 per cent and 2.6 per cent (1.1 and 1.7 p.p.), respectively, compared to the baseline simplified letter. However, combining the belonging language with individualized information on net costs significantly increases registration by 4.6 per cent (3.0 p.p.) over the simplified letter.

When we turn to Cal Grant payout, a proxy for enrollment, we do not see statistically significant increases in overall payouts from any of the letter variants. That is, despite sizeable changes in behavior in the first stage of the process -- registering for a Cal Grant account -- that indicates that one administrative barrier was meaningfully lowered, we do not see second stage impacts on overall take-up of the grant. However, we find evidence that the net cost letters, which aimed to also provide useful information about later stages of the process, significantly changed decision-making on school choice. Specifically, these letters caused increases in enrollment at community colleges, at the lowest cost college of the student's indicated options, and at colleges where they can live at home. While this is only partly in line with the program's goals,<sup>1</sup> it does indicate that

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<sup>1</sup> There is evidence from other settings that students diverted from four-year to two-year colleges are negatively impacted (see, e.g., Long and Kurlaender 2009; Goodman, Hurwitz, and Smith 2017; Bleemer 2020). The Cal Grant is intended to make the four-year options affordable, but for many students cost of living differences mean that community colleges closer to home have lower net cost.

when students are given transparent, clear information that provides individualized estimates of cost differences, they adjust their decision-making. This suggests that both behavioral barriers and information constraints play roles in student decisions.

Our findings have both theoretical and practical implications. Contributing to the literature on administrative burdens, we show that there are clear learning costs and psychological barriers that prevent students from navigating the financial aid process and that can be addressed through simple interventions. Affirming belonging and strengthening a positive social norm can effectively nudge more students to take an important proximate step in accessing financial aid for which they are eligible. Yet, our studies show that unlocking these psychological barriers and jump-starting the process is not sufficient to overcome future barriers, such as understanding complex and personalized details about the costs of tuition. It is only when psychological nudges are combined with salient information on net costs that school choice is affected. A strategy for increasing take-up of student aid and other public benefit programs may involve combining nudges at multiple key pain points with simplification of the overall process to reduce the number of such points and with clearer concrete information on cost and benefits at early stages.

## **Setting and Methods**

The sample for these studies includes all letters mailed to students who were eligible for the Cal Grant A and the Cal Grant B High School Entitlement Awards in 2017-2018 and again in 2018-2019. These awards cover all tuition and fees at public four-year colleges in California for eligible students, with partial coverage at private

colleges and small stipends at community colleges,<sup>2</sup> and are renewable for up to four years. Students with high school grade point averages above 3.0 and family incomes under \$100,000 are eligible for the Cal Grant A, while those with GPAs above 2.0 and incomes under \$50,000 are eligible for the Cal Grant B. CSAC mails notification letters to all high school students meeting these criteria on a rolling basis, beginning in mid-November. A letter is triggered when (a) a high school submits a student's name as meeting the GPA criterion and (b) CSAC receives the student's FAFSA indicating that the income criterion is met. The earliest submitted FAFSAs arrive at CSAC in mid-November and the initial letters are mailed shortly thereafter.

### ***Treatment Design***

In the two years of experiments, CSAC randomly allocated students to receive letters that varied in language and content. Samples of each letter variant are included in the supplementary materials. While the letters alone do not reduce compliance costs, the specific letter variants combined insights from behavioral science with evidence on school choice to address various forms of learning and psychological costs.

The baseline (control) letter was a notification letter produced by CSAC that described the program and instructed recipients to register for Cal Grant accounts on a website, WebGrants4Students, that CSAC maintains. CSAC worked internally to clarify the language and presentation of the notification letter from letters used in prior years for the 2017-18 version. Despite this, the letter remained quite dense and contained several

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<sup>2</sup> Community college tuition in California is very low -- around \$500 per semester for in-state, full-time students. Many students qualify for a separate California Promise Grant that covers this, allowing them to apply the Cal Grant stipend (\$1,672 in the years we study) to living expenses. For students attending private colleges, maximum Cal Grant awards are \$9,084 per year.

undefined acronyms and terms. Moreover, figuring out what one needed to do next to obtain a Cal Grant award required careful reading.

In Year 1, we tested variations of the baseline letter (T1) that measured the impact of simplification (T2) and affirming belonging (T3). T2 drew on evidence from a wide range of behavioral science and communications literature indicating that simplification can have perhaps the biggest proportional change on behavioral outcomes (e.g. Bhargava and Manoli, 2015; DellaVigna and Linos, 2020). Specifically, by making it easy to understand the substance of the letter and, importantly, making it easy to take the next step, simplification both reduces learning costs and removes frictions that may otherwise lead to inaction. As such, T2 contained the same basic information as the baseline letter, but presented it in a dramatically simplified manner, with far less text and with graphical design features that drew attention to the specific action that students needed to take. In particular, the Cal Grant was described as a scholarship, and the call to action to visit WebGrants4Students was enclosed in a red box in the middle of the letter, along with the ID numbers that students would need to create accounts.

T3, a letter aimed at affirming belonging, used the simplified language from T2 but added sentences that emphasized that the addressee belonged in college and that CSAC perceived them as a likely college graduate. This treatment drew from studies that show that reducing belonging uncertainty -- the anxiety related to cues of non-belonging for otherwise underrepresented groups -- disproportionately improves educational outcomes for African American students and women in STEM fields (Walton and Cohen, 2007; Walton *et al.*, 2015). Although most of this literature emphasizes impacts on college performance, the hypothesized mechanism operates through self-perceptions of

belonging in college and institutional expectations about a student's potential success. We anticipated that these mechanisms could be strong at earlier stages in the selection process where students are asked to sort themselves into institutions where they may or may not feel that they belong.

Study 2, the following year, was planned after preliminary results from the first study were available. The early results, confirmed by the longer-run results presented below, indicated that the Simplified letter produced dramatically higher account registrations than the baseline letter, and that the Simplified+Belonging letter improved even further on this. Accordingly, in 2018-9, the baseline letter from the initial study was discarded. The Simplified (T4) and Simplified+Belonging letters (T5) were retained, the first with a slight modification to remove some wording that could imply belonging in the simplified letter, and new variants were added to test additional behavioral hypotheses. We use the Simplified letter (T4) as our control condition in Study 2. Because treatment contrasts were much smaller than in Study 1, we anticipated smaller impacts on outcomes.

To explore additional behavioral interventions in year two, we replaced some sentences of the "belonging" intervention with a clear descriptive social norm (T6), emphasizing that many other high school students were enrolling and utilizing the Cal Grant. A rich behavioral science literature provides wide-ranging evidence that descriptive social norms can impact behavior in various policy areas, especially in contexts where that behavior is relatively invisible to the target population (Cialdini and Trost, 1085; Goldstein, Cialdini and Griskevicius, 2008; Gerber and Rogers, 2009; Hallsworth *et al.*, 2017). Whether these nudges are effective depends, in part, on whether

the target population thinks of the social norm as applicable to them and on whether it changes expectations. As such, it was unclear *a priori* whether a social norm intervention would be effective in this context.

Last, we tested the impact of going beyond a framing nudge to provide new information about college costs that might help students understand the aid landscape. Letter T7 looked similar to the belonging (T5) letter, but included on the back a table of the amount of aid available, and the resulting net costs (including tuition and living expenses), for the specific public colleges and universities in California that students listed on their FAFSAs to receive their financial information (which we interpret as a proxy for application). The table had one row for each school listed on the student's FAFSA and columns showing:

1. The student's planned living situation (on campus, off campus, with parents)
2. Estimated tuition, fees, housing, and other costs
3. Estimated total grant aid
4. Estimated net cost, the difference between columns 2 and 3

Column 1 was taken from the student's FAFSA while Columns 2-4 were taken from colleges' cost calculators, populated with the living situation and personalized family and financial information from the student's FAFSA (see supplemental materials for details). We did not gather the cost information from private colleges, which used widely varying forms that were often not easily scrapable and often requested information not on the FAFSA; from five public colleges in California whose calculators we were not able to scrape, or from out-of-state colleges. When students listed these colleges on their

FAFSAs, the table included rows for them but cost information was listed as “not available.”

Financial aid is highly individualized, and learning about the net costs of different types of colleges may be an important barrier. As such, we expected that most of the students receiving CSAC notification letters overestimate the cost of attendance and underestimate the aid available to them (e.g. Grodsky and Jones, 2007; Scott-Clayton, 2012). Our letters generally arrived several months before colleges’ official aid offers, and were designed to help students be more informed in their planning and thinking about college costs. All of the information that we provided in the comparison table was already available to students -- it was taken from public net cost calculators on each college’s website, mandated under a signature Obama Administration initiative that aimed to support more informed decisions – but we suspected that many students had not accessed the calculators and that many would have been confused by them if they had (Hopkins, 2011; Nelson, 2012).<sup>3</sup> As such, the table provided in T7 may have provided net cost information that was not otherwise in students’ consideration.

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<sup>3</sup> All of our year-2 letters included a URL for a page with a list of links to California colleges’ calculators. Thus, students in all treatment groups had ready access to the information in our net cost letter, though this would have required several potentially daunting steps – collecting financial information, inputting it into college calculators, and compiling the results, often presented in incommensurate ways.

**Table 1. Description of treatments.**

<b>Year</b>	<b>Letter</b>	<b>Treatment</b>	<b>Description</b>
1	T1	Control	Baseline letter created by CSAC
	T2	Simplified	Simplified language and clear call to action
	T3	Simplified + Belonging	Additional sentence: <i>"You have shown that you're the kind of person who belongs in college. We've been working hard to help you get there!"</i>
2	T4	Simplified	Adjusted T2 served as baseline for Year 2
	T5	Simplified + Belonging	Identical letter to T3
	T6	Simplified + Social Norm	Additional sentence: <i>"Join thousands of high school seniors who have claimed their Cal Grant and are not college graduates!"</i>
	T7	Simplified + Belonging + Net Costs	Additional table that included the net cost (tuition and living expenses) of attending the specific colleges listed on student's FAFSA.

All the notification letters focused attention on one key decision, registering for accounts on the CSAC website. While there are many additional compliance hurdles that students face in accessing aid (see Supplementary Information for details), registering for an account is a key step to receiving a Cal Grant scholarship and is a trigger for additional communications about the process. Accordingly, the primary outcome of interest in this study is registration for an account.

However, the main goal of the aid process is not to generate WebGrants4Students accounts but to help students go to and pay for college, and the CSAC letters aim to help students better understand their choices. As secondary outcomes, we measure whether a Cal Grant was paid out for the student in the Fall of the following academic year, and, if so, to what school. Payout of a grant at a particular school implies that the student was admitted and decided to enroll, that she completed all verification processes for the Cal Grant over the summer after high school graduation, and that the college claimed the Cal

Grant on her behalf (which is intended to be automatic, but may in practice require some intervention by the student). By improving students' understanding of the process, the letters could plausibly affect all but the admissions decision, although they were not timed to affect decisions on where to apply. We outline the process in greater detail in Supplementary material.

### *Experimental Design*

Both studies were pre-registered on Open Science Foundation before any outcome data were available, on December 27, 2017 (<https://osf.io/u4sdm>) and November 29, 2018 (<https://osf.io/g3jxk>), respectively.

Students were randomly assigned to receive one of three (in 2017-18) or four (2018-19) letter variants. In both experiments, randomization occurred at the school level, and all students within a school received the same letter variant. This was done in order to reduce the potential for contamination. Random assignment was within 8 strata, based on the high school's count of Cal Grant eligible students and the share whose awards were paid out in the previous two years. Within each stratum, one-third (Study 1) or one-quarter (Study 2) of high schools were assigned to each treatment arm. Randomization was independent in the two years (table S2), and schools were assigned to treatment groups before the first letters in that study were mailed.

We consider all letters sent by June 1st. In Study 1, this was roughly 134,000 letters; in Study 2, it was 131,000. Letters were mailed in batches, and, due to mailroom constraints, the timing of mailing sometimes varied by a few days across treatment arms. We discuss this at greater length in Supplementary Information; we find no evidence that

the timing of mailing affected our outcomes or that it confounds our estimates of treatment effects.

CSAC sent a reminder e-mail in early February to all students who had received letters to date, encouraging them to register for their account if they had not already done so. This email was identical for all students across treatments. CSAC also makes other efforts to reach out to students, including encouraging high school counselors to contact students who have not yet registered (which the counselors can check via their own WebGrants accounts). These too are likely to be similarly distributed across treatment groups.

We estimate experimental impacts via simple OLS (linear probability) regressions of each outcome on the assigned treatment, with fixed effects for assignment strata. Studies 1 and 2 are analyzed separately, and for each the standard errors are clustered at the level of the unit of assignment, the high school.

Most analyses use the full sample of students who received notification letters. In some of our analyses of college choice, we limit the sample based either on the set of colleges listed on the FAFSA (determined before the letter was sent) or to students whose Cal Grants were paid out at some college. The latter is a post-treatment outcome, though as we show there is no effect of the treatment assignment on this outcome.

### *Outcomes*

We present results for three pre-registered primary outcomes: Registration on the CSAC online portal, Cal Grant payout, and choice of specific college. Our pre-registered analysis plan included a fourth primary outcome, enrollment in college, which we cannot

distinguish in the administrative data from payouts.<sup>4</sup> As such, we do not consider it separately here. Registration and payout are coded as binary outcomes. When we examine college choice, we estimate impacts on enrollment at a college in each of several specific segments (e.g., the UC), as well as enrollment (proxied by Cal Grant payout) at the college that had the lowest indicated net cost among all those listed on the student's FAFSA for which we were able to obtain net cost information.

The last of these outcomes was the most complex to construct, as CSAC scraped college cost calculators only for students in the Net Cost treatment arm. To examine college choices, we need comparable measures for students in all arms. We therefore need to impute net costs based on the information in the Net Cost treatment arm. Fortunately, this is not too difficult, as the net cost calculators are deterministic so it is necessary only to recover the formula that they use. To do this, we fit flexible statistical models to the data from the Net Cost arm, then use these models, along with inputs to the cost calculators (which we have for all students) to impute net costs. To ensure comparability across treatment arms, we then use the imputed cost information for all students, even those for whom non-imputed data is available.

The 34,610 students assigned to the net cost treatment listed 169,093 (non-unique) colleges on their FAFSAs, of which 120,636 (71 per cent) were among the 138 public colleges where we could scrape net cost information. For each of these 138 colleges, we fit a random forest prediction model for net costs, using only students in the Net Cost treatment arm who listed that college and using the FAFSA information that

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<sup>4</sup> Students who enroll at out-of-state colleges, who enroll less than half time, or who do not claim their Cal Grant awards will not appear as having received Cal Grant payouts.

was used to populate the calculators as explanatory variables. These random forest models were highly successful at uncovering the college formulae, even in cases where we had relatively few observations -- the predictions from the random forest models correlate 0.996 with the cost calculator output in a hold-out sample. We then use these models to predict net costs for each student-college combination in all treatment arms, and used these predictions to identify the lowest cost school among all those that a student listed for whom net cost information was available. Students who attended schools other than this school, whether net cost information was available or not, are coded as not attending the lowest net cost school.

## **Results**

### *Summary statistics*

Table 2 shows summary statistics for the samples, separately for the two yearly cohorts. In our sample, mean GPAs are a bit above 3.0, while mean family incomes are under \$30,000. Nearly 90% of students are eligible for the Cal Grant B, aimed at students with family incomes below about \$50,000 (depending on family size), while a little under 60% of students are eligible for the Cal Grant A, which has a higher income limit but more demanding GPA requirements. The typical student attends a high school where two-thirds of students are eligible for free- or reduced-price lunches. 57 per cent are eligible for the Cal Grant A, while close to 90 per cent are eligible for the Cal Grant B.

**Table 2. Summary Statistics.**

	<b>Year 1</b>			<b>Year 2</b>		
	<i>Mean</i>	<i>Standard Deviation</i>	<i>Balance p-value</i>	<i>Mean</i>	<i>Standard Deviation</i>	<i>Balance p-value</i>
<b>Number of observations</b>		134,133			135,155	
<b>Student Characteristics</b>						
GPA	3.07	0.55	0.39	3.08	0.55	0.59
Parental income	\$27,832	21,383	0.75	\$28,833	21,531	0.42
Female	58.9%		0.73	59.1%		0.69
Cal Grant A eligible	57.6%		0.54	57.2%		0.46
Cal Grant B eligible	89.3%		0.58	87.0%		0.31
<b>High School Characteristics</b>						
Free-reduced price lunch share	65.2%		0.39	65.4%		0.83
Fraction Black/Hispanic	67.0%		0.39	67.4%		0.76
Number of letters sent	149	92	0.44	149	91	0.81
Fr. of Cal Grants paid out (prior year)	68.1%	9.7%	0.63	71.5%	9.7%	0.93
<b>Colleges listed on FAFSA</b>						
No. of colleges listed	5.2	3.3	0.95	4.9	3.4	0.52
No. of segments listed	2.0	0.9	0.98	1.9	0.9	0.19
No. of colleges with net cost information				3.8	2.8	0.47
<b>Outcomes</b>						
Account registration	66.0%		0.00	65.6%		0.01
Payout (fall)	60.9%		0.70	49.8%		0.42
Payout (full year)	62.4%		0.69			

Note: Parent incomes reported as below 0 or above 100,000 are set to missing. This accounts for 1.1 per cent of observations each year. Colleges listed on FAFSAs are classified into four segments: California community colleges, California State University, University of California, and private. Net cost information is available only for the first three of these.

The net cost treatment (T7) relies on information that students provide about which colleges they are considering. Students list colleges on the FAFSA to designate that their information be shared with those colleges for calculation of financial aid offers. The average student lists around five colleges. In year 2, when we incorporated net cost information, we were able to calculate net costs for an average of 3.8 colleges for each student, all public. We explain the process of obtaining net cost information in the Methods section and in Supplementary Information in more detail.

The last panel of the table shows average outcomes. About two-thirds of students registered for Cal Grant accounts, our primary outcome. In year one, 61% had Cal Grants paid out in the fall, with an additional 1.5 per cent paid out in the spring. In year two, we have only fall payout data, with notably lower total rates than even the fall data from year one, perhaps attributable to delayed reporting from colleges.

Columns 3 and 6 of the table report p-values for tests that the indicated variable has identical means across treatment arms. These are well above standard thresholds for all pre-treatment variables, indicating that randomization was successful. Previewing our main results, we reject the null hypothesis of equality for account registration, but not for grant payout.

### *Main outcomes*

Table 3 presents our main results. In year one, 62 per cent of students who received the control letter created accounts. The Simplified letter (T2) increased this by 8.9 per cent (5.5 percentage points), while the Simplified+Belonging letter (T3) increased it by 11 percent (6.8 p.p.). Both are highly statistically significant, individually and jointly. Effects of the two treatments on Fall Cal Grant payout are much smaller, around

0.5 percentage point, and not statistically significant. Estimates are nearly identical when we include Spring payouts, shown in Supplementary Information. In year two, the baseline letter (T4) was the Simplified letter from year one. The Simplified+Belonging (T5) and Simplified + Social Norm (T6) treatments had small, statistically insignificant effects on account registration relative to this, with point estimates of 1.1 and 1.7 percentage point, respectively.

**Table 3. Effects on account registration and Cal Grant Payout.**

	Year 1		Year 2	
	Account creation	Fall Payout	Account creation	Fall Payout
Control group mean	0.618	0.604	0.642	0.497
Simplified	0.055	0.006		
	(0.008)	(0.007)		
Simplified + Belonging	0.068	0.004	0.011	-0.007
	(0.008)	(0.007)	(0.010)	(0.009)
Social Norm			0.017	0.003
			(0.010)	(0.010)
Net Price			0.030	0.009
			(0.009)	(0.009)
N	134,138	134,138	135,701	135,701
p, all TEs=0	0.000	0.70	0.01	0.42

Notes: All specifications include stratum fixed effects. Standard errors are clustered at the high school level. The control group in year 2 received a similar letter as the Simplified treatment group in year 1.

The combined Net Cost letter (T7), however, did raise account creation by 4.6 per cent (3.0 percentage points) over the baseline T4 letter.. This is statistically significant on its own; in addition, a joint test of the significance of the three treatment effects together, which is not subject to multiple testing issues, is significant at the 1 percent level. The incremental effect of adding net price information to a letter that includes Simplified+Belonging language is twice as large as the incremental effect of Simplified+Belonging relative to Simplified in either year 1 or year 2. We can also reject the null hypothesis that the Simplified+Belonging (T6) and Net Cost (T7) effects are the same in year two, with a p-value of 0.03.

When we turn to effects on Cal Grant payout in year two, we again see small and statistically insignificant effects. Suggestively, the largest point estimate, 0.9 percentage point, comes from the Net Cost letter, but this is not statistically significant.

### *College choice*

The results in Table 3 indicate that our behaviorally informed letters were effective at getting students' attention and inducing them to register accounts, but they do not support the hypothesis that the letters increased overall college enrollment. As per our pre-registration, we next investigate further whether the letters impacted school choice. We are particularly interested here in the Net Cost letter, which aimed to make cost differences among colleges that the student was already considering more transparent and more salient.

Table 4 reports summary statistics for the gross prices and net costs that students faced, at the student-by-school level. The average total price of college before aid is over \$23,000 per year, but the Cal Grant and other grant aid bring this down to a net cost of

just over \$9,000. We also show estimates separately for each of California’s three public education segments: the two-year community colleges (CCs); the four-year, moderately selective California State University (CSUs); and the four-year, more selective University of California (UC). Gross prices vary dramatically across the segments, from just over \$10,000 at the CCs, where students are more likely to plan to live with parents, to nearly \$35,000 at the UC. Net costs are much less variable, but on average are also lower at CCs (\$5,500, vs. around \$10,000 at the four-year segments). This masks a fair amount of variability, however: For 41 per cent of students who listed a UC school the lowest price was in this segment, falling to 33 per cent when we exclude students who listed no CSU or CC schools.

**Table 4. Detail about net prices.**

	<b>All colleges</b>	<b>UC</b>	<b>CSU</b>	<b>CC</b>
N - students	135,701	51,642	79,980	73,951
N - student-school pairs	669,791	163,520	232,370	109,779
N - student-school pairs with price information	511,785	163,520	232,181	108,019
Sticker price (full cost of attendance)	23,148 (10,059)	34,265 (3,154)	21,702 (5,582)	10,374 (5,333)
Aid / Discount	13,992 (7,646)	23,679 (3,671)	11,717 (2,298)	4,898 (1,618)
Net price (full cost)	9,156 (5,032)	10,585 (2,111)	9,985 (5,338)	5,475 (5,518)
Lowest sticker price school is in this segment		12%	63%	94%
Lowest net price school is in this segment		41%	66%	72%
Among those who listed multiple segments:				
Lowest sticker price school is in this segment		0.2%	53%	92%
Lowest net price school is in this segment		33%	56%	41%

Notes: Estimates are based on random forest predictions of costs and aid reported by college cost calculators. Lowest costs are defined only over colleges for which calculator output is available.

Table 5 presents estimates of the impact of the letters on Cal Grant payout in each of the three public segments and at private colleges. We present results for both year one and year two, first for the full samples and then, to examine college choice as distinct from college enrollment, for the subsample of students whose Cal Grants were paid somewhere. We find evidence that the Net Cost letter (T7) shifted students towards community colleges, both from the other public segments and from private colleges. This is consistent with the evidence that community colleges are often the cheapest option and the hypothesis that the Net Cost letter (T7) made comparable costs more salient.

**Table 5. Effects on school choice.**

	All Students				Conditional on any payment			
	<i>UC</i>	<i>CSU</i>	<i>CC</i>	<i>Private</i>	<i>UC</i>	<i>CSU</i>	<i>CC</i>	<i>Private</i>
<i>Panel A: Year 1</i>								
Simplified	-0.005 (0.005)	0.010 (0.007)	0.001 (0.007)	-0.000 (0.005)	-0.010 (0.008)	0.014 (0.010)	-0.002 (0.012)	-0.002 (0.008)
Simplified + Belonging	-0.006 (0.005)	0.006 (0.007)	0.008 (0.007)	-0.004 (0.005)	-0.011 (0.008)	0.007 (0.010)	0.011 (0.013)	-0.007 (0.008)
N	134,138	134,138	134,138	134,138	81,705	81,705	81,705	81,705
Control group mean	0.114	0.208	0.222	0.061	0.189	0.343	0.367	0.101
p, all TEs=0	0.44	0.33	0.52	0.72	0.27	0.40	0.56	0.67
<i>Panel B: Year 2</i>								
Simplified + Belonging	-0.003 (0.005)	-0.008 (0.009)	0.006 (0.008)	-0.002 (0.003)	-0.004 (0.010)	-0.011 (0.014)	0.017 (0.015)	-0.002 (0.006)
Social Norm	-0.002 (0.006)	-0.009 (0.009)	0.015 (0.009)	-0.002 (0.003)	-0.004 (0.011)	-0.020 (0.014)	0.028 (0.016)	-0.005 (0.006)
Net Price	-0.006 (0.005)	-0.001 (0.009)	0.019 (0.009)	-0.003 (0.003)	-0.015 (0.010)	-0.009 (0.015)	0.032 (0.016)	-0.008 (0.006)
N	135,701	135,701	135,701	135,701	67,591	67,591	67,591	67,591
Control group mean	0.104	0.198	0.156	0.040	0.208	0.397	0.314	0.081
p, all TEs=0	0.65	0.62	0.11	0.73	0.40	0.57	0.19	0.58

Notes: All specifications are linear probability models for payout of the Cal Grant at a school in the indicated category, and include strata fixed effects. Samples in columns 5-8 include only those students whose Cal Grants were paid out. Standard errors are clustered at the level of the high school.

To probe this further, Table 6 presents estimates of the effect of our various year-2 treatments on the likelihood of enrolling at the school with the lowest net cost among those listed on the FAFSA. Students who did not enroll at all, or who enrolled at a school

other than those listed schools for which we could calculate net costs, are treated as failures for this outcome. In column 1, we see that the net cost letter raised the probability of choosing the lowest net cost option by 10.4 percent (1.6 percentage point). This coefficient is statistically significant considered on its own ( $p=0.03$ ), though the joint test of all of the treatment effects being zero is only marginally significant ( $p=0.07$ ). The effect is similar when we limit the sample to students who listed schools from at least two segments on their FAFSAs, who typically face larger contrasts in net costs (column 2). When we separate the sample by whether the lowest-net-cost option was a community college (column 3) or some other choice (column 4), we see that the effect is concentrated in the former.<sup>5</sup> The effects generally grow when we limit our sample to students who enrolled at some college, so that we are examining only the intensive margin of choice between colleges rather than the extensive margin of going to college (panel B).

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<sup>5</sup> This analysis was not included in our pre-analysis plan.

**Table 6. Effects on likelihood of enrolling at the lowest net price option.**

	<i>All students</i>	<i>Listed 2+ segments</i>	<i>CC was lowest net cost</i>	<i>CC was not lowest net cost</i>
<b>A. Unconditional</b>				
Simplified + Belonging	0.000 (0.007)	0.000 (0.007)	0.000 (0.010)	-0.002 (0.009)
Social Norm	-0.003 (0.008)	-0.004 (0.007)	0.009 (0.011)	-0.012 (0.009)
Net Price	0.016 (0.008)	0.014 (0.007)	0.029 (0.011)	0.008 (0.009)
N	135,701	80,219	53,512	73,953
p, all TEs=0	0.07	0.07	0.04	0.12
Control group mean	0.159	0.128	0.190	0.154
<b>B. Conditional on any payment</b>				
Simplified + Belonging	0.005 (0.013)	0.001 (0.011)	0.002 (0.020)	-0.003 (0.013)
Social Norm	-0.008 (0.013)	-0.008 (0.011)	-0.002 (0.019)	-0.021 (0.013)
Net Price	0.027 (0.013)	0.024 (0.010)	0.021 (0.020)	0.015 (0.013)
N	67,591	47,186	18,040	46,186
p, all TEs=0	0.06	0.02	0.57	0.028
Control group mean	0.159	0.128	0.584	0.247

Notes: All specifications are linear probability models, including stratum fixed effects. In panel B, samples are limited to students whose Cal Grants were paid out somewhere. Standard errors are clustered at the level of the high school.

The supplementary materials include additional specifications probing the role of living situations in driving these results. Net costs are generally lower when students indicate that they will live at home than when they list the same schools but indicate plans to live on or off campus. The net cost letter causes students to shift their enrollment toward schools where they plan to live at home, and we find marginally significant

evidence that it increases overall Cal Grant payouts for students who listed at least one live-at-home option on their FAFSAs.

### *Heterogeneity*

In exploratory analyses, we examined heterogeneity of effects along several dimensions. Table 7 presents estimates separately for students eligible for Cal Grant B, with family incomes under \$50,000 and high school GPAs over 2.0, and those who are eligible for Cal Grant A but not Cal Grant B. Cal Grant B students come from lower-income households. As such, they are likely to be more reliant on financial aid, and perhaps less well informed, than non-Cal Grant B students. We find that the letters' effects on account registration are somewhat larger for the Cal Grant B students, particularly in year 2. Effects on enrollment at the cheapest college are also concentrated in this group.

**Table 7. Heterogeneity by Cal Grant B eligibility**

	<u>Account registration</u>		<u>Fall enrollment</u>		<u>Cheapest school</u>	
	<b>CG B eligible</b>	<b>Not CG B eligible</b>	<b>CG B eligible</b>	<b>Not CG B eligible</b>	<b>CG B eligible</b>	<b>Not CG B eligible</b>
<i>Panel A: Year 1</i>						
Control group mean	0.608	0.708	0.614	0.522		
Simplified	0.054	0.071	0.006	0.006		
	(0.008)	(0.010)	(0.007)	(0.013)		
Simplified + Belonging	0.068	0.065	0.006	-0.014		
	(0.008)	(0.010)	(0.007)	(0.013)		
N	119,791	14,347	119,791	14,347		
p, all TEs=0	0.000	0.000	0.661	0.274		
<i>Panel B: Year 2</i>						
Control group mean	0.635	0.688	0.503	0.459	0.162	0.136
Simplified + Belonging	0.010	0.014	-0.006	-0.014	0.002	-0.009
	(0.010)	(0.012)	(0.010)	(0.013)	(0.007)	(0.009)
Social Norm	0.018	0.009	0.005	-0.013	-0.002	-0.010
	(0.010)	(0.013)	(0.011)	(0.014)	(0.008)	(0.009)
Net Price	0.032	0.016	0.010	-0.003	0.018	0.003
	(0.009)	(0.013)	(0.010)	(0.015)	(0.008)	(0.010)
N	118,069	17,632	118,069	17,632	118,069	17,632
p, all TEs=0	0.006	0.573	0.424	0.641	0.071	0.384

Notes: All specifications are linear probability models, including stratum fixed effects. Standard errors are clustered at the level of the high school.

Table 8 presents estimates of variation by the date that the notification letter was sent. We distinguish letters sent before and after February 1. We hypothesized that later notification letters might have less effect on college choice, as they may have arrived after, or only shortly before, the financial aid letters that they were meant to preview. On the other hand, late FAFSA filers may be substantively different on unobservables than their early filer counterparts. For example, late FAFSA filers may be less familiar with the overall aid process, may be less settled in their college-going plans, may be more present biased, or may be less organized. The evidence is more supportive of the latter hypothesis. Effects of letters on account registration are somewhat larger for the late filers than for those who filed earlier. Similarly, the effect on payout at the cheapest option is driven by the late FAFSA filers. In addition, for this subgroup (though not for the overall population), we observe a statistically significant positive effect on Cal Grant payout.

**Table 8. Heterogeneity by FAFSA filing date.**

	Account registration		Fall enrollment		Cheapest school	
	Early	Late	Early	Late	Early	Late
<i>Panel A: Year 1</i>						
Control group mean	0.720	0.474	0.657	0.530		
Simplified	0.041	0.075	0.005	0.007		
	(0.008)	(0.010)	(0.008)	(0.010)		
Simplified + Belonging	0.058	0.088	-0.003	0.015		
	(0.008)	(0.011)	(0.008)	(0.010)		
N	78,339	55,799	78,339	55,799		
p, all TEs=0	0.000	0.000	0.522	0.283		
<hr/>						
<i>Panel B: Year 2</i>						
Control group mean	0.702	0.560	0.563	0.408	0.144	0.172
Simplified + Belonging	0.013	0.007	-0.007	-0.005	0.004	0.010
	(0.010)	(0.012)	(0.010)	(0.012)	(0.008)	(0.009)
Social Norm	0.024	0.003	0.001	0.002	0.017	0.014
	(0.011)	(0.012)	(0.011)	(0.012)	(0.009)	(0.010)
Net Price	0.005	0.063	-0.006	0.027	0.011	0.031
	(0.010)	(0.011)	(0.010)	(0.012)	(0.009)	(0.011)
N	78,903	56,798	78,903	56,798	78,903	56,798
p, all TEs=0	0.131	0.000	0.828	0.043	0.232	0.034

Notes: All specifications are linear probability models, including stratum fixed effects. Standard errors are clustered at the level of the high school. Early and late FAFSA filers are defined based on letters sent before and after February 2.

## Discussion

Students finishing high school must make highly consequential decisions about whether to attend college and where to enroll, with enormous financial implications for

themselves and their families. Many lack access to quality college counseling, and may not have accurate information about the costs of their different options or about how to access available aid. Like many other financial aid programs, the Cal Grant program is intended to make college affordable for low- and moderate- income students. However, it can only have limited effects on these students' educational attainment if students do not know it exists, understand how to access it, understand how it affects their net costs of enrollment, and believe it is for them.

We conducted two large scale randomized controlled trials to explore how low-cost letter interventions could impact some of these barriers. Evidence from both studies suggests that the language and framing of the letters can meaningfully impact student decision-making. Those who received simplified letters were substantially more likely to register for WebGrants4Students accounts by June of their senior year of high school. Letters that added language emphasizing that the student belonged in college were even more effective at prompting registration than the basic simplified letter. Changing letter language is free, so the resulting 7 to 9 percent increases in take-up came at zero cost. Importantly, those who received personalized information on the net cost of attending the colleges they had chosen were not only much more likely to register, they were also significantly more likely to choose a low-cost school.

Our findings contribute to three literatures. First, we contribute to a growing literature on administrative burdens. We focus on financial aid, but the gap between financial aid availability and aid take-up mirrors administrative burdens in other policy areas: 12.5% of eligible SNAP recipients do not take-up SNAP (Crouse and Macartney, 2020), 20% of EITC-eligible households do not take-up the Earned Income Tax Credit

(Iselin, Mackay and Unrath, 2021); and 75.5% of TANF-eligible individuals don't take-up that program (Crouse and Macartney, 2020). Our findings suggest that vastly simplifying communications and directly addressing psychological barriers may be critical to helping people start a long and complicated process. This is particularly important for the types of administrative processes where an early pain point (like registering on a website, or registering to vote) can severely limit options down the line. Moreover, although many recent studies show the impact of reducing learning costs by informing people they are eligible to receive a program, our study emphasizes a very different type of learning barrier: being able to carefully and correctly compare the costs and benefits of different types of program offerings. In our setting, reducing learning costs and psychological costs in tandem affects both short-term and longer-term behavior.

Second, our experiments point to both the promise and potential limitations of using low-cost nudges to move behavior. Our findings are largely optimistic. A zero-cost tweak to letters significantly increases the percentage of students who take the desired action, in this case registering for an account. The magnitude of the observed effect on our primary outcome is four to five times larger than the average effect of a government nudge in the US (DellaVigna and Linos, 2020). Yet a successful nudge that moves proximate behavior does not automatically affect behavior down the line. Future unaddressed compliance costs can still limit the impact of a behavioral intervention. Making costs more salient, in combination with other nudges, on the other hand, not only moves immediate behavior, it also has long-term consequences on school choice.

Last, our findings contribute directly to the growing literature on the role of costs in college decision-making. The explanations for why high-achieving low-income students don't go to college at rates that seem optimal span a wide range of literatures. Some include emphasis on present bias (Dynarski *et al.*, 2021); a scarcity mindset (Mullainathan and Shafir, 2013); misunderstanding of the benefits (Hoxby and Turner, 2013), or negative social identities (Lavecchia, Liu and Oreopoulos, 2016). While many of these factors play a critical role in whether students take action in a complicated process, we show that at least among students who have shown some interest in going to college, and have already navigated the complex FAFSA process, at the end of the day, cost is still a primary driver of school choice. Whether or not students *should* be encouraged to attend the lowest-cost university is a policy question outside the scope of this study -- though enabling informed decision making was part of the intent of the policy mandating creation of the cost calculators upon which we rely. Rather, this study points to the relative importance of cost when costs are provided in a comparable and clear way.

Our studies have several limitations. First, we could not vary the timing of communication. The process of personalized communication from CSAC begins after a student has already filled out the FAFSA, a complicated first step of the process that may deter many students. As such, we cannot generalize our results beyond a population of already motivated students who have managed to navigate the first step in a long process. An earlier intervention may have been more effective or may have captured a different subpopulation of high-achieving low-income students. Second, while we can observe Cal Grant payouts, we cannot observe important related components of enrollment -- whether

students were admitted to the colleges of their choice, whether they enrolled but did not take-up the Cal Grant, and whether they received other financial aid for which they were eligible. Last, while we used existing information from college websites to populate our Net Cost letters, we cannot separately verify if the college calculators correctly identify the various costs associated with going to a specific college, and it is possible that more accurate information would have larger effects.

Importantly, this study has practical implications for policymakers eager to use insights from behavioral science to improve service delivery. While our effect sizes are particularly large, relative both to the broader nudge literature and to their cost, we show that different interventions may be most effective at targeting different barriers in a larger, extremely complex administrative process. A range of nudges have positive effects on the proximate outcome, account registration, but only our treatment making comparable information about net costs more salient had an impact on college choice. A policymaker aiming to fundamentally shift college access may consider interventions at various pain points, that also consider different *types* of learning, compliance, or psychological barriers at each stage in the process. These could include direct assistance in filling out the FAFSA (Bettinger *et al.*, 2012); early and inclusive language on financial aid availability, such as that presented in this paper; as well as comparable and salient information on costs either from financial aid agencies, as in this paper, or from the colleges themselves (Dynarski *et al.*, 2021). Policymakers could design and test improvements to the compliance process itself, such as reducing the number of steps required to receive financial aid, and introducing personalized targeting significantly earlier in the process. Last, given the importance of cost comparisons in student decision-

making, policymakers may choose to emphasize the potential benefits of four-year colleges in their communications if they aim to encourage attendance at four-year institutions.

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## Supplementary Text

### A. Letters

Supplement Figures 1-7 reproduce the letters used in the various treatment arms.

### B. Description of Setting

#### *Financial Aid in California*

The higher education landscape in California is complex. The state hosts two independent four-year public university systems, the University of California and the California State University, as well as a now 116-campus community college system that is the largest higher education system in the United States. It also has a host of for-profit and not-for-profit private colleges and universities. Tuition and fees vary dramatically among these institutions, as do institutional financial aid programs. Among the public segments, tuition and fees at the UC are more than double those at the CSU, which in turn are more than triple those at the community colleges.

The state has a range of different public programs that provide college aid, operating under the collective name of Cal Grant. We focus on two varieties of Cal Grants, the Cal Grant A and Cal Grant B entitlement awards. These are entitlements for students who meet eligibility criteria, based on high school grades and family income, and who enroll in college within a year of graduating from high school. The Cal Grant A is for high-achieving, moderate-income students pursuing associate's or bachelor's degrees. Students must have a GPA above 3.0 and a household income of less than \$100,000 (with some variation by family size). The Cal Grant B is for low-income students, with household incomes of less than \$50,000, who meet a lower high school achievement threshold, with a GPA above 2.0.

The terms of the Cal Grant A and B differ in their details but are similar in broad strokes: Both cover the full cost of in-state tuition and required fees at a public institution. Thus, the generosity of the Cal Grant is tied to institutional tuition levels, so it is more generous at the high-cost UC than at the lower-cost CSU, and more generous at both than at community colleges, which have much lower fees. Students who attend private colleges in the state receive awards that do not generally cover full tuition but are nevertheless quite generous relative to comparable programs in other states. For example, the well-known Georgia HOPE scholarship is worth about \$2,000 per semester (or half this at private institutions); the CalGrant is worth as much as \$12,600 per year for a student attending UC, or \$9,000 for a student attending a private, non-profit college.

The Cal Grant layers on top of the federal Pell Grant. The UC and to a lesser extent the CSU also have institutional aid programs; community college institutional aid budgets are much smaller. These can support living expenses, which are not covered by the Cal Grant (with the exception of a small payment for Cal Grant B students). The result is that for many students the net cost of attending college may be lower at the CSU and UC than at community colleges, despite the much higher sticker prices. Offsetting this for many students is the fact that there is much more likely to be a community college than a UC

within commuting distance of a student's home, which can allow for substantial cost savings.

Colleges provide calculators on their websites that are meant to help students forecast the total amount of aid they will receive. Each college has its own calculator, and they vary in the information they solicit; sometimes colleges in the same system (e.g., different Cal State campuses) seem to use the same calculators, but in other cases they do not. In particular, the different UC campuses each seem to use different calculators. As an illustration, the fields solicited by the UC Berkeley web form for dependent students (the fields are somewhat different for independent students) are:

- Housing plans (on campus, off campus, with parents)
- Parents' marital status
- Parents' anticipated number of dependents in college
- Number of people in parents' household
- Total parental assets
- Total parental income
- Parental earned income
- Parental income tax paid
- Parental other income
- State of residency
- Total student assets
- Total student income
- Student income tax paid
- Student other income

A student who provides this information is given non-binding estimates of tuition costs, fees, housing costs, and other living expenses, along with estimates of total available grant aid, inclusive of federal, state, and campus sources.

For our Net Cost (T7) letters, we use the information from students' FAFSAs to populate the calculators for each of the colleges that the student listed on the FAFSA. All of the requested information from the UC, CSU, and CC calculators is available from the FAFSA, though some private colleges solicit information (like father's occupation) that is not available. We draw estimates only from the public institutions.

Supplement Table 1 presents a hypothetical example of a student from a family of four with income of \$30,000, using real output from the college calculators. For this student, the net cost at UC Berkeley was almost 40% lower than at Long Beach Community College, reflecting the additional \$11,000 value of the Cal Grant and an additional \$13,000 in non-Cal Grant grant aid, even though the sticker price at Berkeley was nearly twice that at Long Beach. Anecdotally, the potential for this kind of ranking reversal is not widely appreciated. In our sample, 58% of students whose FAFSAs listed both a community college and a CSU or UC campus had lower estimated net costs at one of the four-year schools than at any of the community colleges. Discussions with CSAC and campus aid officials suggest that this largely reflects more generous institutional aid budgets at the CSU and, especially, the UC than at the community colleges.

Supplement Figure 7 – the example T7 letter – shows another illustration. This table shows a student who listed five UC campuses on their FAFSA. In this case, each of those campus’ calculators shows a different value for estimated costs and for estimated grant aid. This may reflect real differences among campuses in either their cost structure (particularly for housing costs) or their financial aid policies, or differences in the assumptions made by their respective calculators. We cannot be sure that the estimates are always accurate, but because they are drawn from the colleges’ own calculators we are assured that they reflect the information that colleges are providing to prospective students.

### *The process of applying for aid*

The process of establishing eligibility for and claiming the Cal Grant has several steps and involves both the students and their colleges. High schools provide GPAs for all members of their senior classes to CSAC, usually at the beginning of the school year but sometimes later. Students must then submit FAFSAs, as early as October 1st of their senior year. These FAFSAs include student family and financial information. Students also provide a list of schools to which they would like their information to be sent. We interpret this as a weak proxy for where students actually apply (though note that community colleges do not require traditional applications – students can simply register for classes). For each listed school, students indicate whether they plan to live on campus, off campus, or with parents.

CSAC receives FAFSA information from the federal Department of Education and uses this information to identify potentially eligible students. Once a student is identified as potentially eligible, CSAC mails the student a preliminary notification of his or her award eligibility. Notification letters include instructions about how students can claim their awards. They are sent by postal mail, with the first letters going out in mid-November of the senior year and additional letters processed on a rolling basis through the next spring as FAFSA information arrives to CSAC. Importantly, both UC and CSU admissions applications are due by the end of November, so notification letters will generally not arrive in time to influence application decisions.

The notification letters direct students to register for accounts on WebGrants4Students, CSAC’s online portal for students. On the portal, they must confirm their GPAs and eventually report the college or university they will be attending. Many students are contacted by federal programs or by colleges over the summer after the senior year and asked to provide documentation for the information provided on the FAFSA.

To receive the Cal Grant, students must enroll in a qualifying college program in the year following high school graduation (or, only for those who register for WebGrants4Students accounts in that year, in the following year). Following enrollment, institutions must verify both that the student meets the financial eligibility requirements and that the student is enrolled in a program that meets Cal Grant eligibility guidelines. In principle, colleges then claim the Cal Grant on the student’s behalf and apply it to the student’s tuition charge. However, CSAC reports that some colleges fail to claim awards

on behalf of all of their eligible students so it may be necessary for the student to advocate for herself at this stage as well.

### C. Mailing timing

The first 2017-18 preliminary notification letters were printed in the second week of November for students who submitted FAFSAs shortly after they became available in October. By that point, over 30,000 students had been identified as eligible. To overcome internal logistical hurdles involved with printing and mailing so many letters, CSAC printed and mailed them in batches. The first large batch of 6,004 Baseline (T1) letters were mailed on November 20, 2017, with another 5,967 following on November 27-28. Following this, 12,041 Simplified (T2) letters were mailed November 28-30. The Simplified + Belonging (T3) letters were then mailed, with 4,002 on November 30 and December 1. By December 7, the mailings had evened out, with a cumulative total of between 17,000 and 18,000 in each treatment arm. New batches were sent approximately weekly thereafter as students filed their FAFSAs and were identified as eligible, with much smaller gaps between treatment arms. Baseline letters were typically mailed on Monday with Simplified and Simplified + Belonging letters following later in the week.

In year 2, batching was reduced and the initial round of letters for three treatment arms (T4, T5, and T6) were mailed approximately simultaneously, between November 27 and December 3, 2018. However, bugs in the programs used to populate the Net Cost letters (T7) delayed the initial large batch of these letters until December 18-20.

In each year, less than half of the letters were mailed by the end of December, with additional letters generated on a rolling basis as FAFSAs arrived to CSAC. We include in our analyses only students whose letters were mailed by June 1. Although in principle the federal FAFSA deadline is not until June 30, institutional aid deadlines are much earlier and there were relatively few letters mailed this late in the season. Supplement Figure 8 shows the distribution of mailing dates, indicating both the overall time pattern and the differences in mail dates across treatment arms early in the year. Vertical lines show key dates: The UC application deadline (November 30), the UC and CSU “priority deadline” for FAFSA submission (March 2), and the deadline for accepting UC admissions offers (May 1).

In year 2, the Simplified treatment arm (T4) amounted to fewer total letters than the other arms. This arose randomly; approximately the same number of high schools were assigned to each arm, but the schools assigned to this arm generated fewer letters, on average, than the others. A test of the hypothesis that the average number of letters per school was the same in each treatment arm yields  $p=0.11$ . As discussed in the main text, we do not find any systematic differences in observable characteristics of students or high schools assigned to different arms in either year.

When we measure account registration we include only accounts registered by September 1. Although a few account registrations trickle in after this time, the number is small, and is unlikely to be affected by letters sent months earlier.

The variation in mailing timing across treatment arms raises the possibility that this could contribute to (or mask) the effects of the letter content. If a letter received in early December is more likely to be read or acted upon than one received later in December, for example, that would lead us to understate the impact of our alternative treatments in year 1 relative to the control condition, or the impact of the net cost treatment relative to the other three in year 2. We have conducted extensive additional analyses to confirm that this is not a factor in our results. Specifically, we have estimated versions of our main specifications that control for flexible polynomials in the mailing date, and have estimated event study models that measure the treatment effects on account registrations based on registrations that occur within a few weeks of when the student's letter was mailed (while controlling for calendar time patterns in registration). Neither of these yields qualitative changes in our results.

#### D. Additional Results

Supplement Table 2 shows the distribution of high schools across treatment arms in the two years. High schools are included in the table for a given year only if at least one letter was sent to a student at that school, and the treatment arm is indicated as missing otherwise. (Schools that received no letters in either year are excluded entirely.) A chi-square test of independence of the two years' assignments, estimated only on schools included in each year, has a p-value of 0.516.

Supplement Table 3 presents results for the impact of the letter variants on enrollment at any time in the academic year after high school graduation. The first two columns repeat the results for account creation and fall semester enrollment from Table 3. In the final column, we modify the column-2 dependent variable to code as 1 students who first enrolled in the spring following high school graduation. We do not have complete data for this for year 2, so we present results only for the year-1 experiment. The enrollment rate goes up only 1.5 percentage points when spring data are included, and not surprisingly our estimates of treatment effects do not change.

Supplement Table 4 shows an analysis of the role of living at home as a moderator of the effect of the net cost letter. In columns 1 and 2, we take as the outcome the payout of the Cal Grant at a college where the student listed on the FAFSA a plan to live at home while attending. We see positive effects of the net cost letter on this outcome. In column 3, we estimate effects on any Cal Grant payout in the subsample of students who listed at least one college with the live-at-home option, while in column 4 we further limit the sample to students who listed at least one *four-year* college where they planned to live at home. We find marginally statistically significant effects of the net price letter on payout of the Cal Grant in column 3, though not in column 4.

Supplement Table 5 presents an additional heterogeneity analysis, parallel to those in Table 7 and 8, that was specified in our project pre-registration. Here, we divide high schools by the share of the recipients of the prior year's Cal Grant notification letters for whom the grant was eventually paid out, and estimate the impact of our treatments

separately for schools that are above and below median. We do not see meaningful differences in treatment effects across this dimension.

Supplement Figure 1: Treatment 1



## Cal Grant Preliminary Eligibility Notification

- [REDACTED]
- [REDACTED]
- [REDACTED]

Date 01/19/2018  
 CSAC ID Number [REDACTED]

### Congratulations!

**You have been awarded a preliminary Cal Grant award for the 2018-19 academic year!**

Governor Edmund G. Brown Jr., the Legislature and the California Student Aid Commission (CSAC) are investing in YOU because of your academic achievements and determination. Based on the information you provided to CSAC on your Free Application for Federal Student Aid (FAFSA) or California Dream Act Application (CADAA) as well as your GPA, you have been determined to be preliminarily eligible for a Cal Grant.

Cal Grant award amounts vary by the type of college you choose to attend and enrollment status. These are the current Cal Grant maximum amounts you could receive if you enroll at an eligible California campus in the following segments:

College Segment	Maximum Cal Grant Award Amount
California Community College (CCC):	\$1,672
California State University (CSU):	\$5,742*
University of California (UC):	\$12,630*
Private, Non-Profit or WASC-accredited colleges:	\$9,084*
Non-WASC accredited For-Profit Colleges:	\$4,000*

\*Cal Grant B students may also receive a \$1,672 access award in addition to the amount listed above.

In addition to a Cal Grant you are potentially eligible for a Federal Pell Grant, for approximately \$ 5920. These grants, and any other financial aid that you might receive, will help you cover the costs of attending college, which include tuition and fees, food and housing, and books and supplies.

**The Cal Grant and Pell Grant do not require repayment** and is only one part of your financial aid package. After you are admitted, the campus financial aid office will provide a full financial aid award notice. In addition to the Cal Grant and Pell Grant, you may also be eligible for one or more of the following:

- Institutional grants or scholarships offered at public and private colleges and universities;
- California College Promise Grant;
- Work-Study Program or Federal Student Loans;
- Other types of financial aid offered at your campus of attendance, such as private scholarships and student loans.

This is an initial Cal Grant award notification only. You must still apply for admission to the campus you plan to attend. Your college makes the final eligibility determination for Cal Grant prior to disbursing your award. For questions about final eligibility determination and disbursement dates, reach out to the financial aid office at your chosen campus.

***Make California and your families proud by continuing and completing your education.***  
 Claim your Cal Grant Award by logging onto WebGrants for Students at [www.csac.ca.gov/mygrantinfo](http://www.csac.ca.gov/mygrantinfo)  
 See enclosed flyer for more information

*Lupita Cortez Alcalá*  
 Executive Director

E1PRP2 (11/17)

**PRIVACY STATEMENT:** Cal Grant information for students who are 18 years of age or older, or who have attended a postsecondary institution, will only be released to parents or guardians with written [authorization](#) from the student.



Supplement Figure 2: Treatment 2

- [REDACTED]
- [REDACTED]
- [REDACTED]

Date 01/19/2018  
 CSAC ID Number [REDACTED]

Dear [REDACTED],

Congratulations! Based on your hard work and record of academic achievement, you have been preliminarily selected to receive a **Cal Grant scholarship**. This scholarship will help you pay for the costs of college for all four years if you remain eligible. It does not need to be repaid.

Go to [www.csac.ca.gov/mycalgrantinfo](http://www.csac.ca.gov/mycalgrantinfo) and take the first step to claim **your** scholarship!

Grant ID number: [REDACTED]  
 CSAC ID number: [REDACTED]

As you research different college options, remember that **the Cal Grant is designed so that tuition cost doesn't determine which college you choose to attend**. The maximum amounts you would receive are listed below:

College Segment	Maximum Cal Grant Award Amount
California Community College (CCC):	\$1,672
California State University (CSU):	\$5,742
University of California (UC):	\$12,630
Private, Non-Profit or WASC-accredited colleges:	\$9,084
Non-WASC accredited For-Profit Colleges:	\$4,000

In addition you may be eligible for a living stipend of up to \$1,672 per year, and for other grants, such as an estimated \$ 1170 in a Federal Pell Grant.

Good luck with your applications! You are already on your way to becoming a college graduate!

Sincerely,

*Lupita Cortez Alcalá*  
 Executive Director  
 California Student Aid Commission

E1TG12 (11/17)

**PRIVACY STATEMENT:** Cal Grant information for students who are 18 years of age or older, or who have attended a postsecondary institution, will only be released to parents or guardians with written [authorization](#) from the student.



Supplement Figure 3: Treatment 3

- [REDACTED]
- [REDACTED]
- [REDACTED]

Date 01/19/2018

CSAC ID Number [REDACTED]

Dear [REDACTED],

Congratulations! Based on your hard work and record of academic achievement, you have been preliminarily selected to receive a **Cal Grant scholarship**. This scholarship will help you pay for the costs of college for all four years if you remain eligible. It does not need to be repaid.

**You have shown that you're the kind of person who belongs in college. We've been working hard to help you get there!**

Go to [www.csac.ca.gov/calgrantinfo](http://www.csac.ca.gov/calgrantinfo) and take the first step to claim **your** scholarship!

Grant ID number:  
 CSAC ID number: [REDACTED]

As you research different college options, remember that **the Cal Grant is designed so that tuition cost doesn't determine which college you choose to attend**. The maximum amounts you would receive are listed below:

College Segment	Maximum Cal Grant Award Amount
California Community College (CCC):	\$1,672
California State University (CSU):	\$5,742
University of California (UC):	\$12,630
Private, Non-Profit or WASC-accredited colleges:	\$9,084
Non-WASC accredited For-Profit Colleges:	\$4,000

In addition you may be eligible for a living stipend of up to \$1,672 per year, and for other grants, such as an estimated \$ 5920 in a Federal Pell Grant.

Good luck with your applications! You are already on your way to becoming a college graduate!

Sincerely,

*Lupita Cortez Alcalá*  
 Executive Director  
 California Student Aid Commission

E1TG22 (11/17)

**PRIVACY STATEMENT:** Cal Grant information for students who are 18 years of age or older, or who have attended a postsecondary institution, will only be released to parents or guardians with written [authorization](#) from the student.



Supplement Figure 4: Treatment 4

- [REDACTED]
- [REDACTED]
- [REDACTED]

Date 11/16/2018

CSAC ID Number [REDACTED]

Dear [REDACTED],

Congratulations! You have been preliminarily selected to receive a **Cal Grant**. This scholarship will help you pay for the costs of college, and it does not need to be repaid.

Go to [www.csac.ca.gov/2019calgrant](http://www.csac.ca.gov/2019calgrant) and take the first step!

CSAC ID number: [REDACTED]

As you research different college options, remember that **the Cal Grant is designed so that tuition cost doesn't determine which college you choose to attend**. The maximum amounts you would receive are listed below:

College Segment	Maximum Cal Grant Award Amount
California Community College (CCC):	\$1,672
California State University (CSU):	\$5,742
University of California (UC):	\$12,570
Private Nonprofit College or University:	\$9,084
Private For-Profit College or University:	\$4,000 - \$8,056

You are also eligible for other grants, such as an estimated \$ [REDACTED] in a Federal Pell Grant. You can learn more about your financial aid options at [www.csac.ca.gov/netprice](http://www.csac.ca.gov/netprice).

Good luck with your applications!

Sincerely,

*Lupita Cortez Alcalá*

Executive Director  
California Student Aid Commission

E1G191 (11/18)

PRIVACY STATEMENT: Cal Grant information for students who are 18 years of age or older, or who have attended a postsecondary institution, will only be released to parents or guardians with written authorization from the student.



Supplement Figure 5: Treatment 5

- [REDACTED]
- [REDACTED]
- [REDACTED]

Date 11/16/2018

CSAC ID Number [REDACTED]

Dear [REDACTED],

Congratulations! Based on your hard work and record of academic achievement, you have been preliminarily selected to receive a **Cal Grant**. This scholarship will help you pay for the costs of college, and it does not need to be repaid.

**You have shown that you're the kind of person who belongs in college. We've been working hard to help you get there!**

Go to [www.csac.ca.gov/2019grant](http://www.csac.ca.gov/2019grant) and take the first step!

CSAC ID number: [REDACTED]

As you research different college options, remember that **the Cal Grant is designed so that tuition cost doesn't determine which college you choose to attend**. The maximum amounts you would receive are listed below:

College Segment	Maximum Cal Grant Award Amount
California Community College (CCC):	\$1,672
California State University (CSU):	\$5,742
University of California (UC):	\$12,570
Private Nonprofit College or University:	\$9,084
Private For-Profit College or University:	\$4,000 - \$8,056

You are also eligible for other grants, such as an estimated \$ [REDACTED] in a Federal Pell Grant. You can learn more about your financial aid options at [www.csac.ca.gov/calc](http://www.csac.ca.gov/calc).

Good luck with your applications! You are already on your way to becoming a college graduate!

Sincerely,

*Lupita Cortez Alcalá*  
Executive Director  
California Student Aid Commission

E1PR91 (11/18)

PRIVACY STATEMENT: Cal Grant information for students who are 18 years of age or older, or who have attended a postsecondary institution, will only be released to parents or guardians with written [authorization](#) from the student.



Supplement Figure 6: Treatment 6

- [REDACTED]
- [REDACTED]
- [REDACTED]

Date 11/16/2018  
 CSAC ID Number [REDACTED]

Dear [REDACTED],

Congratulations! Based on your hard work and record of academic achievement, you have been preliminarily selected to receive a **Cal Grant**. This scholarship will help you pay for the costs of college, and it does not need to be repaid.

**Join thousands of high school seniors who have claimed their Cal Grant and are now college graduates!**

Go to [www.csac.ca.gov/2019award](http://www.csac.ca.gov/2019award) and take the first step!

CSAC ID number: [REDACTED]

As you research different college options, remember that **the Cal Grant is designed so that tuition cost doesn't determine which college you choose to attend**. The maximum amounts you would receive are listed below:

College Segment	Maximum Cal Grant Award Amount
California Community College (CCC):	\$1,672
California State University (CSU):	\$5,742
University of California (UC):	\$12,570
Private Nonprofit College or University:	\$9,084
Private For-Profit College or University:	\$4,000 - \$8,056

You are also eligible for other grants, such as an estimated \$ [REDACTED] in a Federal Pell Grant. You can learn more about your financial aid options at [www.csac.ca.gov/cost](http://www.csac.ca.gov/cost).

Good luck with your applications! You are already on your way to becoming a college graduate!

Sincerely,

*Lupita Cortez Alcalá*  
 Executive Director  
 California Student Aid Commission

E1G291 (11/18)

PRIVACY STATEMENT: Cal Grant information for students who are 18 years of age or older, or who have attended a postsecondary institution, will only be released to parents or guardians with written [authorization](#) from the student.



Supplement Figure 7: Treatment 7

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**You have shown that you're the kind of person who belongs in college.  
We've been working hard to help you get there!**

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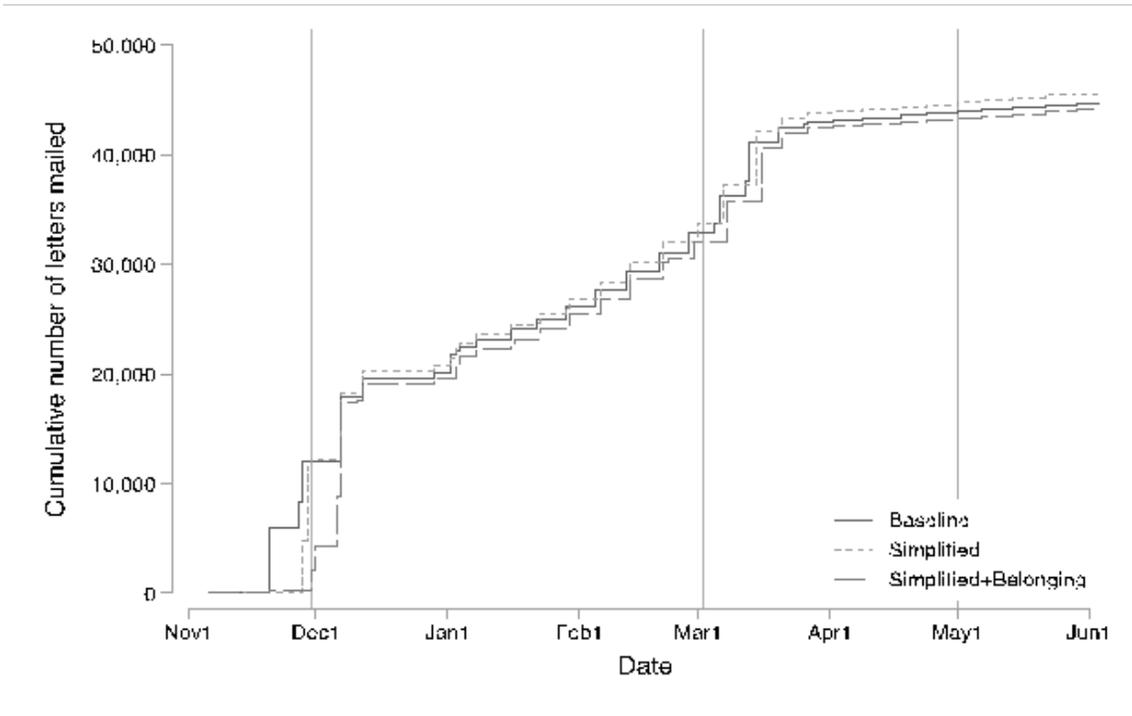
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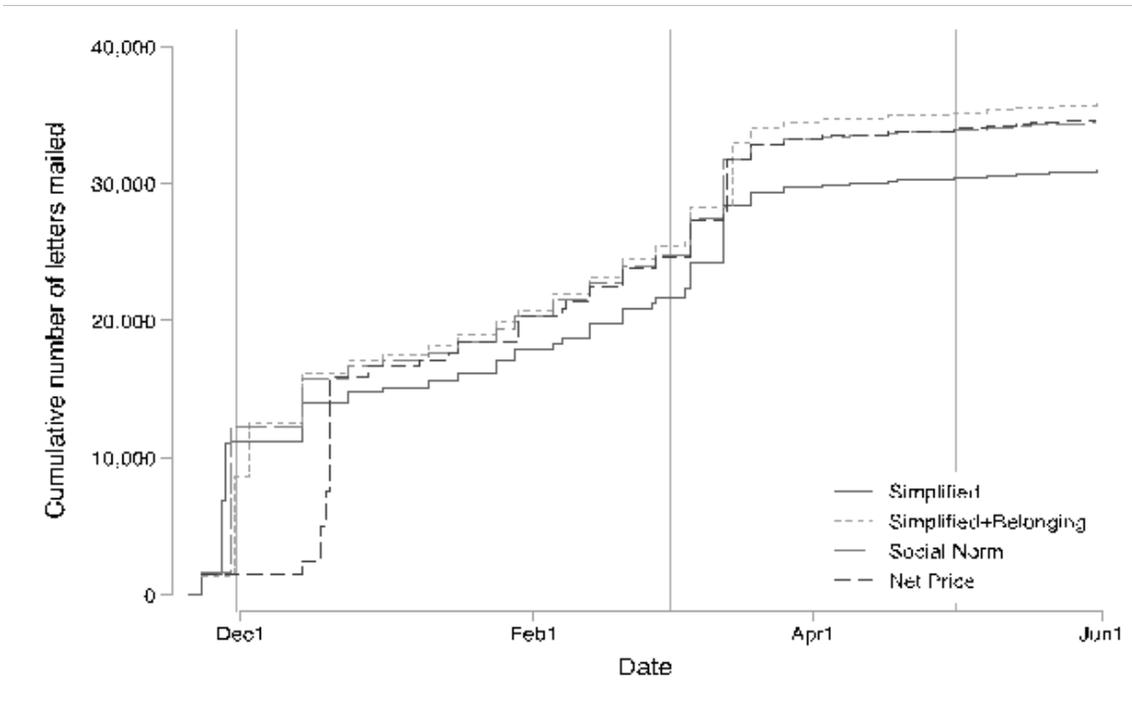
Visit [www.csac.ca.gov/price](http://www.csac.ca.gov/price) for information about institutions where estimates are not available.

Supplement Figure 8

A. Year 1



B. Year 2



Notes: Figures show the cumulative distribution of letter mailing dates by treatment arm in the two years. Vertical lines indicate the University of California application deadline (November 30), the UC and CSU "priority deadline" for FAFSA submission (March 2), and the deadline for submitting statements of intent to register for students admitted to UC (May 1).

**Supplement Table 1. Illustrative net price table.**

	<b>UC Berkeley</b>	<b>San Francisco State University</b>	<b>Cal State Los Angeles</b>	<b>Long Beach Community College</b>
Housing plans	On campus	On campus	Off campus	Off campus
<b>Costs</b>				
Tuition & fees	\$ 17,048	\$ 6,476	\$ 6,632	\$ 1,182
Room & board	\$ 18,144	\$ 13,434	\$ 14,502	\$ 12,492
Books & supplies	\$ 916	\$ 1,860	\$ 1,948	\$ 1,791
Other expenses	\$ 3,048	\$ 2,878	\$ 2,974	\$ 4,399
<i>Total cost of attendance</i>	<i>\$ 39,156</i>	<i>\$ 24,648</i>	<i>\$ 26,056</i>	<i>\$ 19,864</i>
<b>Grant aid</b>				
	\$ 12,630	\$ 5,742	\$ 5,742	\$ 1,672
Other grants	\$ 17,726	\$ 7,561	\$ 7,215	\$ 4,143
<i>Total grant aid</i>	<i>\$ 30,356</i>	<i>\$ 13,303</i>	<i>\$ 12,957</i>	<i>\$ 5,815</i>
<i>Estimated net price</i>	<i>\$ 8,800</i>	<i>\$ 11,345</i>	<i>\$ 13,099</i>	<i>\$ 14,049</i>

Notes: Table reflects actual output from four college cost calculators for a hypothetical student from a family of four with income \$30,000 who lists the indicated housing plans on the FAFSA. Cost elements, total grant aid, and estimated net price (equal to total cost minus grant aid) are obtained from the calculators. We impute the value of the Cal Grant and compute the value of other grants based on this.

**Supplement Table 2. Assignment of high schools in year 1 and year 2.**

	Year 2 assignment				Not in sample	Total
	Simplified (control)	Simplified + Belonging	Simplified + Social Norm	Simplified + Belonging + Net Costs		
<b>Year 1 assignment</b>						
<b>Control</b>	185 7.5%	183 7.4%	159 6.4%	176 7.1%	54 2.2%	757 30.7%
<b>Simplified</b>	181 7.3%	179 7.3%	174 7.1%	172 7.0%	51 2.1%	757 30.7%
<b>Simplified + Belonging</b>	171 6.9%	175 7.1%	199 8.1%	173 7.0%	57 2.3%	775 31.4%
<b>Not in sample</b>	47 1.9%	51 2.1%	42 1.7%	39 1.6%	0 0.0%	179 7.3%
<b>Total</b>	584 23.7%	588 23.8%	574 23.3%	560 22.7%	162 6.6%	2468 100.0%

Notes: Table shows unweighted counts of high schools assigned to each combination of treatments in years 1 and 2, among all schools with Cal Grant-eligible students in at least one year. Schools with Cal Grant-eligible students in only one year are listed as "not in sample" in the other year. Percentages are of the total count of 2,468 high schools that appear in either year. For schools that appear in both years, a  $\chi^2$  test of independence of the two years' assignments is 5.219 ( $p=0.516$ ).

**Supplement Table 3. Effects on enrollment in any semester of the first year.**

	<b>Year 1</b>		
	<b>Account</b>	<b>Fall</b>	<b>Full-year</b>
Control group mean	0.618	0.604	0.619
Simplified	0.055 (0.008)	0.006 (0.007)	0.006 (0.007)
Simplified + Belonging	0.068 (0.008)	0.004 (0.007)	0.005 (0.007)
Social Norm			
Net Price			
N	134,138	134,138	134,138
p, all TEs=0	0.000	0.70	0.69

Notes: All specifications include stratum fixed effects, and standard errors are clustered at the high school level. Columns 1 and 2 repeat results from Table 3. Column 3 shows results where the dependent variable is enrollment in any semester/quarter of the academic year after high school graduation. This outcome is available only for year 1 of the experiment.

**Supplement Table 4. Effects on Cal Grant payout in year 2, by availability of live-at-home options**

	<b>Payout at school listed as live at home</b>		<b>Payout of Cal Grant</b>	
	<b>All</b>	<b>Conditional on any payout</b>	<b>Students listing at least one live-at-home school</b>	<b>Students listing at least one live-at-home 4-year school</b>
Control group mean	0.158	0.317	0.464	0.593
Simplified + Belonging Social Norm	0.006 (0.008)	0.016 (0.015)	-0.004 (0.012)	0.008 (0.014)
Net Price	0.000 (0.009)	-0.001 (0.016)	0.004 (0.014)	0.004 (0.016)
N	0.020 (0.009)	0.034 (0.015)	0.022 (0.012)	0.004 (0.014)
p, all TEs=0	135,701	67,591	71,876	36,446
	0.11	0.08	0.18	0.94

Notes: All specifications are linear probability models, including stratum fixed effects. Standard errors are clustered at the level of the high school.

**Supplement Table 5. Heterogeneity by high school prior-year enrollment rate.**

	<u>Account registration</u>		<u>Fall enrollment</u>		<u>Cheapest school</u>	
	<u>Low enrollment</u>	<u>High enrollment</u>	<u>Low enrollment</u>	<u>High enrollment</u>	<u>Low enrollment</u>	<u>High enrollment</u>
<i>Panel A: Year 1</i>						
Control group mean	0.603	0.637	0.576	0.644		
Simplified	0.056 (0.010)	0.060 (0.012)	0.009 (0.008)	0.005 (0.012)		
Simplified + Belonging	0.074 (0.010)	0.064 (0.013)	0.006 (0.009)	0.000 (0.012)		
N	78,255	54,071	78,255	54,071		
p, all TEs=0	0.000	0.000	0.580	0.868		
<i>Panel B: Year 2</i>						
Control group mean	0.616	0.662	0.454	0.530	0.153	0.163
Simplified + Belonging	0.020 (0.015)	0.002 (0.013)	-0.005 (0.013)	-0.009 (0.013)	0.001 (0.011)	0.001 (0.010)
Social Norm	0.002 (0.016)	0.022 (0.012)	-0.017 (0.013)	0.010 (0.014)	-0.015 (0.010)	0.004 (0.011)
Net Price	0.023 (0.014)	0.033 (0.012)	0.012 (0.012)	0.005 (0.012)	0.017 (0.012)	0.017 (0.011)
N	54,856	78,757	54,856	78,757	54,856	78,757
p, all TEs=0	0.271	0.271	0.227	0.520	0.040	0.356

Notes: All specifications are linear probability models, including stratum fixed effects. Standard errors are clustered at the level of the high school. Low and high enrollment high schools are based on below and above median in the distribution of the share of the prior year's Cal Grant eligible seniors for whom the grants were paid out.