



Behavioral barriers transitioning to college

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A B S T R A C T

This paper presents a review of mostly experimental evidence demonstrating the potential usefulness of simplifying the college admission and enrollment process. Seemingly small differences in the process of students transitioning to college often determine whether some matriculate or not. Behavioral models that imply the possibility of sub-optimal long-run outcomes may be needed to better explain these results. We argue that the model which fits the results best is one where some students are inattentive to their college possibilities and therefore let opportunity slip by. Making the process to get to college easier and more salient helps offset this inattentiveness and prevents some exiting high school from falling through the cracks.

1. Introduction

Roughly one in five of today's high-school seniors in North America don't go on to pursue post-secondary education (Ma et al., 2016). Similar, yet varied, transition rates are present in European countries (OECD, 2016). And, relatively fewer students transition to college from rural areas and disadvantaged backgrounds. One explanation, following the classical human capital investment model described by Becker (1962), is simply that college may not be worthwhile.¹ If students correctly expect the costs from attending college to exceed the lifetime benefits, then stopping at high school makes sense. Some research encourages this explanation by noting that it has proven difficult to measure skill improvement directly for many marginal students who barely get admitted to college (Arum and Roksa, 2011). However, other research finds that even marginal students gain in the long-run by pursuing a postsecondary degree - not necessarily in a Bachelors of Arts or Science program, but at least in some type of two or four-year vocational or general study.²

Returns to college certainly vary across individuals, but a recent estimate indicates that the financial returns to a four-year college degree for someone who is on the border of admission is an average of 22 percent (Zimmerman, 2014).³ The non-financial returns to attending appear significant as well. Increased college attainment has been estimated to improve health outcomes (Buckles et al., 2016), raise geographical mobility (Malamud and Wozniak, 2012), improve out-

comes in competitive marriage markets (Lafortune, 2013; Chiappori et al., 2009), and increase the time parents spend with their children (Kalil et al., 2012).⁴ College also offers impressive consumption value too, in terms of unparalleled opportunities to socialize with a large number of similarly aged youth, join clubs, try new activities, as well as partake in sports and entertainment activities (Oreopoulos and Salvanes, 2011; Jacob et al., Forthcoming). How much of expected college returns are from signalling and whether better program matches are possible remain open and important questions, but for the ex-ante decision of whether to go on to college or stop at high school, the college investment appears worthwhile.

So why don't more students take advantage of post-secondary education, and how might policies help? Financial costs may certainly be a barrier for some, even with access to government loans and grants (Lochner and Monge-Naranjo, 2012), but a mounting array of evidence suggests that psychological factors also play a substantial role in college enrollment outcomes. Youth are particularly predisposed to the pursuit of immediate gratification and to downplay the future. Research in developmental psychology and neuroscience suggests that youth are worse than adults at evaluating decisions with long-term consequences; they focus more on the present than their adult selves would, and are inclined to engage in more risk-taking behavior (Lavecchia et al., 2016). These psychological factors, therefore, may pose significant barriers to careful deliberation on college decision-making.

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¹ We refer to 'college' as any traditional two- or four-year post-secondary educational program. Where necessary, we distinguish explicitly between two- and four-year degree granting programs.

² See Oreopoulos and Petronijevic (2016) and Barrow and Malamud (2015) for summaries of the empirical research.

³ See Ost et al. (2016) and Hoekstra (2009) for additional and similarly sized estimates on the financial returns to college education.

⁴ See Grossman (2006), Oreopoulos and Salvanes (2011), and Barrow and Malamud (2015) for summaries on the non-financial returns from attending college.

Behavioral models that imply sub-optimal long-run outcomes may be needed to help explain and predict high school to college transitions. These models also suggest to researchers and practitioners policies that classical economic models would overlook. Such policies often involve changing the way in which choices are presented or simplifying the decision-making process itself, and have been shown to positively affect college outcomes, often at low cost.

While behavioral economics has long garnered attention in the fields of finance (e.g. Benartzi and Thaler, 1995; Odean, 1999), saving (e.g. Choi et al., 2002; Madrian and Shea, 2001), and health (e.g. Johnson and Goldstein, 2003), it has only recently started to focus on decisions surrounding education (Lavecchia et al., 2016). Recent field experiments demonstrate the potential that behavioral economics has in affecting positive change in this arena. Arguably the most promising interventions to date focus on helping with the high school to college transition. This paper presents an overview of these experiments, and concludes from them some generalizable mechanisms underlying why they have been, for the most part, successful.

2. Section I – changing college enrollment by changing the enrollment process

Several recent studies demonstrate how seemingly small differences to the process of transitioning to college can nevertheless significantly affect enrollment and attainment outcomes. In this section, we first look at examples that highlight differences in the process of applying or obtaining financial aid. While the amount of aid certainly impacts the college-going decision, an aversion to borrowing may play an equally or even more important role. We also discuss several interventions that have demonstrated how simplifying the financial aid process can make the difference between going or not going to college. We then discuss some studies which simplify the application to go to college, as well as the choice of which program of study to apply for. Finally, we discuss attempts to help students through remaining registration and course selection steps during the summer.

2.1. Behavioral interventions that target college costs

An inability to finance college through borrowing can impede realizing large gains to schooling. Long-term benefits from attending college occur in the future, whereas the cost to attending college is immediate. For this reason, governmental and institutional financial aid for low-income families is often employed to improve the welfare of prospective students. Although not always effective in removing liquidity constraints entirely (Lochner and Monge-Naranjo, 2012; Oreopoulos and Petronijevic, 2013), financial aid has been shown to increase college access (e.g. Avery et al., 2006; Fack and Grenet, 2015; Dynarski, 2003; Angrist et al., 2016a; Ford and Kwakye, 2016).⁵ Some countries like the U.S. have pursued “high-tuition, high-aid pricing” strategies, making it imperative that low- to middle-income families receive financial aid to attend college (Page and Scott-Clayton, 2016).⁶

Even when liquidity constraints have been removed, many potential students do not transition to college (e.g. Bettinger et al., 2012), and even for those who do, many still do not apply for the financial aid that is available to them – a feature common to many countries’ financial aid programs (Booij et al., 2012; King, 2004; Kofoed, 2017). For instance, Booij et al. (2012) note that in the Netherlands, only 35% of available loan-based financial aid is utilized by post-secondary students. Further, changes to effective tuition costs have been shown to

have little impact on college enrollment rates (e.g. Bulman and Hoxby, 2015; Hoxby and Bulman, 2016). One explanation for these findings, consistent with the traditional investment model, is that students and their families lack complete information about the financial costs and benefits of post-secondary education, and are thus unwittingly optimizing over an incomplete information set. In support of this explanation, some studies have shown students often overestimate the tuition costs of further education, have inaccurate beliefs about the returns to college education, and are unfamiliar with what financial aid is available to them (e.g. Avery and Kane, 2004; Johnson et al., 2011). Dynarski and Scott-Clayton (2006) note that it is especially likely for prospective low-income students to be first-generation college applicants and have fewer peers engaging in the application process, reducing informal information transmission mechanisms.⁷

Increasing the salience and availability of information for prospective college students has therefore been an important endeavour for many researchers and practitioners. To understand how best to do this – especially for lower income students – researchers have conducted field experiments testing the effectiveness of different modes of providing information pertaining to college affordability and its associated financial returns. For instance, Oreopoulos and Dunn (2013) show that among a sample of disadvantaged senior-year high-school students in Toronto, assigning a short video detailing the benefits of post-secondary education as well as asking students to try a financial aid calculator can significantly increase students’ intent to attend college and lower their concern over the cost of doing so. Such interventions can impact younger students too, before many important decisions like what high-school classes to enroll are made. For example, McGuigan et al. (2016) report similar findings to Oreopoulos and Dunn (2013) when providing grade 10 high-school students in the United Kingdom with information on tuition fees and the benefits of attending college; and, Dinkelman and Martinez (2014) find that Chilean eighth-grade students who received DVDs detailing financial aid opportunities increase their enrollment in college-preparatory high-school classes. These and the other interventions discussed in this section are summarized in Table 1.

However, while such interventions consistently appear to decrease the information gap for high-school students, the magnitude of these effects is generally unimpressive. Evidence surrounding information effects on actual college enrollment and financial aid take-up is even more mixed. For instance, Kerr et al. (2015) show that among high-school students in Finland, detailing the labor market returns to education during a 45 min in-class information session updated students’ beliefs on the returns to pursuing different career fields, but had no effect on college application or enrollment decisions. Further, Hastings et al. (2015) and Busso et al. (2017) both show that among senior-year Chilean high-school students, providing college-specific information about the average returns to further education did not increase students’ college enrollment rates.⁸ And, using a sample of roughly 80,000 high-school students in the state of Texas who had applied to college, Bergman et al. (2016) show that sending emails and postal-mail informing families of available tax credits and the Free Application for Federal Student Aid (FAFSA) had no effect on students’ eventual college enrollment. Together, these results suggest that incomplete information about the financial costs and benefits to attending college is not the only barrier dissuading students from enrolling.

Researchers have thus also pursued behavioral explanations for low financial aid take-up and college enrollment. One such explanation for low college enrollment is that students are averse to borrowing for college expenses. Students are said to be debt averse if they have the

⁵ The timing of the promise of financial aid appears to matter for students’ enrollment decisions too. For example, Ford and Kwakye (2016) shows how promising financial aid for college in advance of graduation (e.g. grade ten through grade twelve) increases the rate at which low-income students in New Brunswick enroll in college by 6 percent.

⁶ See Page and Scott-Clayton (2016) for a review of the literature on barriers to college access in the U.S.

⁷ For a detailed overview of the literature on the information gaps prospective students have with regards to financing post-secondary education, see Scott-Clayton (2013).

⁸ Busso et al. (2017) also provided students with information about financial aid. While both Busso et al. (2017) and Hastings et al. (2015) found no impact on overall college enrollment, institutional choice was affected by the information interventions.

Table 1
Interventions to reduce real and perceived college costs.

Authors	Treatment	Data	Research design	Findings
Angrist et al. (2016a)	Susan Thompson Buffet Foundation awards of up to \$13,050 to cover state tuition and cost of books (but can be used flexibly) administered through stratified random assignment. Sent emails and letters to over 1 million students or prospective students in Texas detailing information about tax credits for college.	Scholarship application data, Nebraska public colleges' administrative data, and the National Student Clearinghouse.	Field experiment	Awards offered to high-school students intent on going to community college boosted enrollment by 5 percentage points. For those intent on going to a four-year college, awards increased enrollment by 3 percentage points. No effect on student college attending outcomes.
Bergman et al. (2016)	(i) Personalized advice in completing the FAFSA (FAFSA Treatment Group); (ii) Personalized financial aid estimates and encouragement to complete the FAFSA on their own (Information Only Treatment Group).	Administrative data from the Texas Higher Education Coordinating Boards, Texas' online college application portal, and email software. Administrative data from H & R Block in Ohio and North Carolina, the Department of Education, and the National Student Clearing House.	Field experiment	Students randomly assigned to the FAFSA Treatment group were (i) 16 percentage points more likely to complete a FAFSA (56 versus 40 percent); (ii) 11 percentage points more likely to be enrolled in college and receive financial aid (41 versus 30 percent); (iii) 9.4 percentage points more likely to be enrolled full time (31 versus 22 percent); (iv) 8 percentage points more likely to be enrolled in college for 2 years (36 versus 28 percent). Students randomly assigned to the Information Only Treatment group had outcomes similar to those in the control group.
Bird et al. (2017)	Sent emails and text messages to over 450,000 students, encouraging them to complete and submit a FAFSA. Messages were randomized between highlighting the financial benefits of filing a FAFSA, employing positive trait activation, and providing concrete application steps.	National Student Clearinghouse data.	Field experiment	Providing concrete guidance on the FAFSA submission process increased college enrollment by 1.1 percentage points, but providing information on the financial benefits of filing the FAFSA alone, or employing positive trait activation alone did not affect enrollment rates significantly. The positive results for the FAFSA guidance treatment arm are driven by students who would not have attended college enrolling in a two-year institution.
Busso et al. (2017)	Provide customised information via email on financial aid and the expected returns of selective and less selective colleges to Grade 12 Chilean students.	Student survey data and administrative data.	Field experiment	Providing information had no effect on the probability students enrolled in college, but for those enrolling in less selective colleges, students in the treatment group opted to enroll in schools with shorter degree programs with lower financial costs.
Castleman and Page (2016)	12 text message reminders about re-filing the FAFSA to renew financial aid after the freshman year.	Administrative data from the National Student Clearinghouse and uAspire (a non-profit organization) for 808 college students in Boston and Springfield, Massachusetts.	Field experiment	Community college students randomly assigned to receive text message reminders were 1.4 percentage points more likely to persist into their sophomore year (baseline persistence rate of 64 percent). The intervention had no effect on 4-year college students (baseline persistence rate of 87 percent).
Dinkelman and Martinez (2014)	15 min informational video on the higher educational experience of 13 adults, including information on eligibility for financial aid.	Survey and administrative data for more than 6000 eighth grade students in Chile.	Field experiment (randomization at the school level)	Students randomly assigned to receive the treatment were 6 percentage points more likely to be enrolled in college-preparation high-school classes (66 versus 60 percent). Effects were largest for students randomly assigned to take DVDs home to view with their families.
Field (2009)	Randomly assigned two financial aid packages to NYU Law School students, differing in the period for which students would likely consider themselves in debt under each aid package.	Law school admission data, financial aid application data, and student surveys.	Field experiment	Students assigned to the aid package which framed the student to be in debt for longer were more likely to find employment in low-paying public interest law, thereby not having to pay back the financial aid package.
Ford and Kwakye (2016)	Future to Discover (FTD): "Learning Accounts" up to \$8000 in funds for college related expenses, and after-school workshops offering early career education.	Administrative data from high schools in two Canadian provinces.	Field experiment	Eligibility for Learning Accounts increased college enrollment by 6 percentage points, and for students from lower-income families with lower parental-education, the after-school workshops increased the probability of college enrollment by 11 percentage points.
Hastings et al. (2015)	Chilean students who had applied to college received information on expected earnings and program costs for their chosen program as well as for alternative programs.	Chilean administrative data for student-level high school records, as well as administrative records for college application, enrollment, graduation, and student aid outcomes.	Field experiment	No effect on total college enrollment, but students from low-socioeconomic backgrounds applied to college programs where previous attendees' earnings net of program costs were 3.4% greater than mean earnings net of

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Authors	Treatment	Data	Research design	Findings
Jensen (2010)	Information on the difference in earnings between university, secondary and primary school educated men between the ages of 30 and 40.	Survey data from eighth grade boys in the Dominican Republic.	Field experiment (randomization at the school level)	program costs. Students randomly assigned to receive information on the returns to education (i) were 4.1 percentage points more likely to enroll in school for grade 9 (59 versus 55 percent); (ii) completed 0.2 more years of schooling (10 versus 9.8 years of schooling). Treatment effects were largest for the least poor students.
Kerr et al. (2015)	Information session on the earnings differences between various postsecondary degrees and program.	Survey and administrative data for 3500 Finnish graduating high-school students.	Field experiment (randomization at the school level)	The college application and enrollment behavior of students randomly assigned to the information treatment was no different than control group students.
McGuigan et al. (2016)	Information on the potential earnings, benefits, and net costs of attending college, as well as information on financial aid options. Treated students also received a postcard and a 5 minute video on the same topic.	Survey data for more than 12,000 high-school students at 56 schools in London.	Field experiment (randomization at the school level)	Students randomly assigned to the treatment group were (i) 3.9 percentage points less likely to believe that the costs of higher education are a barrier to attending (7.8 versus 11.7 percent); (ii) 3.3 percentage points more likely to believe that university graduates have better labor force outcomes (83.7 versus 80.4 percent); (iii) 0.6 percentage points more likely to express university application intentions (59.6 versus 59 percent) (not significant).
Nguyen (2008)	Information on the returns to education delivered through (i) presenting national statistics on the average returns to education; (ii) a role model; (iii) national statistics and a role model.	Administrative and survey data for primary school students in Madagascar.	Field experiment (randomization at the school level)	Students randomly assigned to receive information on the returns to education through national statistics scored .24 standard deviations higher on standardized tests. Students randomly assigned to receive information on the returns to education through a mentor score .08 standard deviations higher on standardized tests (not significant).
Oreopoulos and Dunn (2013)	Short video on the potential earnings gains from postsecondary education (PSE), costs of PSE, eligibility for financial aid and a personalized financial aid calculator to estimate financial aid.	Survey data from 1600 low-income high-school students (5 high schools) in Toronto, Canada.	Field experiment	Among students unsure about their education attainment, random assignment to treatment led to a (i) 24.1 percentage point decrease in the belief that costs are a barrier to attending college (37.6 versus 61.7 percent; (ii) 15 percentage point increase in community college aspirations (23 versus 8 percent); (iii) 23 percentage point increase in university aspirations (65 versus 42 percent).
Page et al. (2016)	In Texas and Delaware, customised messages were sent to students regarding the status of their FAFSA application, the next steps for FAFSA completion, and to allow students to engage with facilitators on the progress of their FAFSA application.	Student-level administrative data, FAFSA submission data, text message receipt data, and data from the National Student Clearinghouse.	Field experiment	Students in Texas submitted their FAFSA applications earlier and were 4 percentage points more likely to enroll in a four-year college. Students in Delaware were 5 percentage points more likely to submit a FAFSA over students in the previous year, relative to control states.

ability to borrow to finance post-secondary education but choose not to and subsequently fail to realize a worthwhile expected return because of the negative psychic costs and stress that arise from holding debt (Lavecchia et al., 2016).⁹ Again, this phenomenon appears particularly prominent among students from low income families (Baum and Schwartz, 2013; Callender and Jackson, 2005).

Field (2009) presents the most robust demonstration of this phenomenon in education financing. In a field experiment at New York University (NYU) Law School, students were randomly assigned one of two financial aid packages, both equal in their net-present monetary values. The experimental manipulation lay in the framing of the financial aid packages: the first financial aid package consisted of tuition loans, which would be repaid by NYU on behalf of the student in the ten years after graduation, conditional on the student becoming employed in a low-paying public interest job; the second financial aid package consisted of tuition waivers which would only have to be repaid by the student if they became employed in a high-paying job as opposed to a low-paying public interest job. In particular, the only substantive difference between the two treatments lay in the amount of time the student was considered to “be in debt”. The experimental design thus allowed systematic differences in students’ employment decisions upon graduation to be attributed to the psychological effect of being in debt. The author finds that students who received the first financial aid package (and were consequently in debt for an additional three years throughout the degree itself) were much more likely to find employment in low-paying public interest law, relative to their classmates who received the second financial aid package.¹⁰ While not directly relatable to many high-school seniors, this result demonstrates that the framing of financial assistance matters. If law students from an elite degree-granting institution can be impacted by the decision to take on more debt, we can expect that the psychological costs of holding debt to be large for many prospective college attendees.

The design, set-up, and salience of financial aid applications matter for college enrollment too. Application packages that are long and complicated do little to accommodate the psychological biases known to be present in adolescents (and in all of us). Recent evidence from the field shows how simplifying the application process and flow of these forms matters substantially. One of the most effective types of interventions used to combat the frustration and procrastination that often accompanies filing financial aid applications involves personalized assistance. In contrast to the interventions involving only information on financial aid, helping parents and youth through forms and offering advice and support has had marked impacts on college enrollment.

Bettinger et al. (2012) enact a field experiment testing the potential for personalized assistance to increase FAFSA application rates and subsequent college enrollment. The authors partnered with H & R Block, a company which – among other services – assists many low-income families and individuals in completing their tax returns. The field experiment took place in the U.S. states of Ohio and North Carolina, and among low income families who had at least one family member between the ages of 15 and 30 without a bachelor’s degree. These families were randomly assigned into one of two treatment groups and a control group. Families in one treatment group were invited to extend their regular appointment with a tax professional for an additional 10 min to receive personalized assistance in completing a FAFSA (The *FAFSA Treatment*). For these families, much of the FAFSA was pre-populated using information from the families’ tax

returns. Families were also provided with information on the cost of tuition of nearby four- and two-year colleges and on the financial aid they should expect to receive upon submitting the FAFSA. Families in the second treatment group were provided with the same information on their expected financial aid receipts as well as on the tuition costs of nearby colleges (The *Information Only Treatment*). However, families in this treatment group did not receive assistance in completing the FAFSA.

Graduating high-school students in families exposed to the *FAFSA Treatment* were 16 percentage points (40 percent) more likely to file the FAFSA than their counterparts in the control group, and an impressive 8 percentage points (24 percent) more likely to attend college. Moreover, not only did more students attend, but most of them stayed for at least two years as well (even though the intervention helped only with initial FAFSA completion). Given the relatively low costs of this ten-minute intervention, these results offer the possibility that personalized assistance targeted towards individuals and families most likely to face barriers to attending higher education may have large welfare benefits. However, corroborating evidence from existing field experiments on the effectiveness of only providing information to students on the costs of college, families in the *Information Only Treatment* were no more likely to file the FAFSA or have family members enroll in college than those in the control group.

Inspired by the success of personalized assistance in raising financial aid application rates, researchers are exploring ways to scale up such interventions in a low-cost manner. Given their negligible marginal cost, sending text messages is a particularly attractive approach to doing so. The efficacy of sending text messages to nudge students is being explored by researchers in the education literature in a variety of experimental settings, from encouraging college matriculation (e.g. Castleman and Page, 2015), bettering in-college performance (e.g. Oreopoulos and Petronijevic, 2016), and raising financial aid applications among already enrolled college students (e.g. Castleman and Page, 2016). Most notable in regard to students’ financial aid applications, Page et al. (2016) conduct two large-scale text message based interventions with the hope of raising total, and on-time, FAFSA submissions.

Page et al. (2016) implement two separate experiments within the U.S. states of Texas and Delaware. In Texas, they partnered with numerous public-school districts comprising of 66 high schools and 17,000 high-school senior-year students. Building upon an already established contract between the Texan public-school districts and a data management and communications platform, the researchers sent weekly text messages to all students in a random subset of schools throughout the winter of 2015. These text messages contained information on the FAFSA application process and were often customized to students’ personal FAFSA filing statuses.

In Delaware, the researchers treated all high-school seniors in that state to a text based intervention, using a quasi-experimental difference-in-difference methodology to test for the intervention’s effects. The Delaware intervention further differed to Texas’ in that students had to opt-in to the intervention group through a state survey directed at all public high-school senior-year students. This intervention ran from January to August of 2015, and included generalised text messages relating to financial aid applications and other information pertinent to the transition to college.

The results of these studies are encouraging. While not raising overall submission rates, the intervention in Texas caused FAFSAs to be submitted earlier in the academic year. By the end of February, FAFSA completion and submission rates were 5 to 6 percentage points higher among senior-year students in treatment schools than in control schools. Although this difference in submission rates did not persist throughout the intervention, the timely submission of FAFSA applications may have led to increased college attendance; in Texas, college enrollment increased by 4 percentage points among students in treated schools, and was primarily driven by an increase in four-year college enrollment. In

⁹ As Lavecchia et al. (2016) note, aversion to holding debt may also be consistent with rational behavior if the student is sufficiently risk-averse and post-degree earnings are sufficiently uncertain (Baum & Schwartz, 2013).

¹⁰ Students who received the first financial aid package were also technically in debt for ten years after graduation, even when they took a public interest job. For these students, the university paid off their debt over ten years, with the debt in the student’s name.

Table 2
Interventions related to college preparation and applications.

Authors	Treatment	Data	Research Design	Findings
Angrist and Lavy (2009)	Achievement Awards demonstration: \$1500 for passing the Israeli high-school matriculation exam.	Administrative data for high-school seniors from 40 low-performing Israeli schools.	Field experiment (randomization at the school level)	Eligibility for the cash reward increased the probability of passing the matriculation exam by (i) 5.2 percentage points for boys and girls (29 versus 24 percent) (not significant); (ii) 10.5 percentage points for girls (39 versus 29 percent); (iii) -2.2 percentage points for boys (18 versus 20 percent) (not significant).
Angrist et al. (2016b)	Enrollment through lottery in Boston charter schools. The school adheres to a "No Excuses" pedagogy, focusing on discipline and academic success.	Administrative data for 8851 applicants to six Boston-area charter high schools.	Quasi - experiment	Lottery winners had a 24 percentage point increase in the likelihood of qualifying for a state university scholarship, were 13 percentage points more likely to enroll in a 4-year college, and 11 percentage points less likely to enroll in a 2-year college.
Avery (2010)	Randomly selected 52 of 107 high-school students to provide them with 10 h of personal college advising.	Student surveys	Field experiment	Although not statistically significant, treated students were 7.9 percentage points more likely to enroll in highly competitive colleges.
Avery (2013)	Tutoring and college application assistance.	Administrative data from the College Possible Program.	Field experiment	Students randomly assigned to the College Possible program were (i) 30 percentage points more likely to apply to a 4-year college; (ii) 44 percentage points more likely to apply to a selective institution; (iii) 15 percentage points more likely to enroll in a 4-year college.
Burszdyn and Jensen (2015)	Students given the opportunity to sign up for a free SAT prep course were told that their decision to sign up for the course would be kept private from everyone except their classmates or private from everyone, including their classmates.	Administrative and survey data for more than 800 low-income high-school students in Los Angeles.	Field experiment	In non-honors classes, sign-up rates are 11 percentage points lower for students who are told that their sign-up decision would be made public. In non-honors classes, sign-up rates are statistically indistinguishable across students in the treatment and the control group.
Burszdyn et al. (2017)	Offer lottery for free SAT prep package to students in low-income and high-income Los Angeles public high schools. Randomized at the individual level whether students' decisions to sign up for the package would be made public knowledge (as well as the accompanying diagnostic test for those who win the lottery), and the probability students will win the SAT package conditional on signing up.	Authors measures of students' outcomes.	Field experiment	Overall, SAT prep package sign-up is lower when the sign-up decision is public (53 percent vs. 80 percent). In high-income schools, sign-up rates decrease by 26 percentage points when the decision is public and the probability of winning the package increases from 25% to 75% ("Cool to be Smart"). In low-income schools, sign-up rates increase by 18 percentage points when the chance of winning the lottery increases from 25% to 75% ("Smart to be Cool").
Carrell and Sacerdote (Forthcoming)	Personalized mentoring and assistance in completing financial aid and college application forms.	Administrative data from New Hampshire high schools.	Field experiment	Women randomly assigned to mentors were 14.6 percentage points more likely to enroll in college, but the mentoring had a negligible impact on men.
Fryer (2016)	Sixth and seventh grade students in Oklahoma were provided with a free mobile phone. Some students received text messages detailing the link between human capital and future outcomes. And, some students received phone credits for reading books outside of school. There was a treatment arm where students received both text messages and were rewarded for reading outside of school.	Student survey responses and administrative data on demographic information, school attendance, school performance, and on test scores.	Field experiment	Students' awareness of the link between human capital and later-life outcomes improved, but there was no measurable impact on student effort, attendance or state test scores. However, conditional on taking the ACT entrance exam, students in the information-only treatment scored 0.13 standard deviations higher than the control group.
Hastings et al. (2015)	Randomly provide Chilean high-school students historical information on the earnings and costs of past students' college-major combinations, for almost all such combinations in the Chilean higher education system.	High-school and college education records, tax return data, and administrative college enrollment records.	Field experiment	Upon receiving the intervention, students were no more likely to enroll in college, but for low-income students, the average net-value of the college-major chosen increased by 3.4%.
Oreopoulos and Ford (2016)	In-class personalized assistance for completing financial aid and college enrollment applications were randomized at the school-level. Three one-hour workshops.	Individual-level administrative application and registration data for high schools and colleges in Ontario.	Field experiment	In the 2011-12 cohort, students in treated schools were 22 percent more likely to submit a college application. This result was driven primarily by students applying for two-year college programs.
Oreopoulos et al. (2012)	Comprehensive intervention for at-risk high-school students including: mandatory (free) tutoring sessions, one-on-one and group mentoring, free public transit tickets (conditional on school attendance), up to \$4000 for	Administrative data for more than 6000 disadvantaged high-school students in Toronto, Ontario.	Difference-in-differences analysis of personalized assistance intervention.	Eligibility for the Pathways to Education Program increased: (i) 5-year high-school graduation rates by 15 percentage points (60 percent versus 45 percent); (ii) college enrollment rates by 19 percentage points.

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Table 2 (continued)

Authors	Treatment	Data	Research Design	Findings
Pallais (2015)	college tuition and fees, college application assistance and fee waivers. Before 1997, college applicants were able to send 3 ACT score reports to schools for free. After 1997, 4 free reports were allowed with additional reports costing \$6.	American Freshman Survey	OLS and difference-in-differences	Before 1997, more than 70 percent of ACT takers sent exactly 3 reports. After 1997, fewer than 20 percent sent exactly 3 reports and 70 percent sent exactly 4 reports. After 1997 students applied to colleges with 0.35 to 0.50 points higher on the ACT.
Rodriguez-Planas (2012)	Quantum Opportunity Program (QOP): \$1.25 per hour devoted to prescribed educational and developmental activities plus a lump sum payment matching their earnings paid upon obtaining a high-school diploma or GED and enrolled in postsecondary education or training.	Administrative and survey data from low-achieving students from low performing high schools entering in Grade 9 in 1995 in the United States.	Field experiment	Eligibility for the QOP: (i) increased high school or GED completion by 4.3 percentage points (71 versus 67 percent) (not significant); (ii) increased postsecondary education enrollment by 5 percentage points (36 versus 31 percent).

Delaware, the effects of the intervention on the FAFSA application process were more pronounced, with overall FAFSA submissions increasing markedly; by the end of June, FAFSA submission and completion rates are estimated to have increased by 5 percentage points from the previous year, relative to comparison schools in control states.

Lastly, Bird et al. (2017) conduct a similar intervention at the national level, also with promising results. The study finds that nudging senior-year high-school students in the U.S. through various modes of messaging to take the necessary steps to complete financial aid applications increases college enrollment by roughly one percentage point. While far from addressing all FAFSA impediments, the program is impressive given its scale and cost; the study involved over 450,000 high-school students. Sending text-messages, emails, and postal mail at a cost of 50 cents a student to increase college enrollment even by just one percentage point at the national level seems worthwhile.

2.2. Behavioral interventions that target college applications

Access to financial aid is not the only barrier to college enrollment. Even with financial resources to meet the up-front costs of attending college, many students who would benefit from attending, still do not enroll.¹¹ For many students who lack clear guidance, the college application process is arduous, complex, and may pose a barrier itself to college attendance. Students who hope to attend must choose which schools and programs to apply to, and submit applications which can require the student to pass standardized tests and submit a written essay (Oreopoulos and Ford, 2016).¹² Moreover, students are often required to pay college application fees or arrange for such fees to be waived. As with the financial aid application process, economists have typically considered the costs associated with these processes as negligible in relation to the lifetime net-benefits associated with attending college. Recent interventions however, summarized in Table 2, suggest otherwise.

One indication of the phenomenon is the stark contrast between students' college enrollment intentions, and their actual outcomes. For instance, the Chicago Public School (CPS) Board tracked CPS high-school students throughout the college application and enrollment process, measuring students' initial college-enrollment intentions against their final outcomes. The CPS Board found that of students who reported in their junior year a desire to complete a four-year college degree, only 59 percent actually completed an application to such a program in their senior year (Roderick et al., 2008). This phenomenon is present among the more qualified students in the CPS sample too.

Recent studies also show how sensitive students' application decisions are to factors in the application process itself. For example, Bulman (2015) provides evidence that lengthening students' proximity to Scholastic Assessment Test (SAT) test centers reduces college application rates noticeably (the SAT is often required for admission into U.S. colleges); the author estimates that closing a SAT test centre in a high school reduces SAT test-taking of students in that school by roughly 5 percent, and of this 5 percent of students, an estimated 39 percent would have attended a four-year college had they written the test.¹³ Similarly, Pallais (2015) finds that changing the default number of free American College Testing (ACT) – a test similar in function to

¹¹ Bulman et al. (2016) further supports these findings with a convincing natural experiment. Using the universe of US federal tax records and exploiting state lottery winnings, the authors show that financial resources have only a modest impact on college enrollment rates, and that low-income households are less responsive to changes in their budget constraints than their high-income counterparts.

¹² Avery and Kane (2004) show that a large share low-income students from high schools in Boston, Massachusetts, who aspire to attend college fail to complete a college application because of their aversion to writing essays.

¹³ Other studies detailing the impact that access to SAT and ACT test taking centres have on actual test-taking and college enrollment include Goodman (2016); Hyman (2016); Klasik (2013); and, Hurwitz et al. (2015). Together, these studies indicate that mandating students take college entrance exams increases overall college enrollment, particularly at 4-year college degree-granting institutions.

the SAT – score reports that test takers can submit from three to four (where additional reports cost only \$6), substantially increases the number of schools students send test results to, illustrating the power of defaults in college applications. In addition to highlighting how the application process matters for students' college enrollment outcomes, the changes in behavior noted in [Bulman \(2015\)](#) and [Pallais \(2015\)](#) appear at odds with careful deliberation assumed by traditional investment models, given that the actual net-benefits of college attendance remained relatively stable.

Results such as these have encouraged researchers to test interventions aimed at simplifying the application process as well as making the option to attend college more salient. Of these interventions, many of the most effective have focussed directly on assisting students complete the application process itself, and have involved some form of personal assistance. The LifeAfterHighSchool experiment was conducted within the Canadian province of Ontario in the 2011-12 and 2013-14 academic years, assisting students from low-transition high schools with both the financial aid and the college application processes ([Oreopoulos and Ford, 2016](#)).¹⁴ The intervention sought to reduce the perceived and actual upfront costs of these processes by providing students with personalized assistance in the form of classroom instruction, and by removing college application fees. Notably, the intervention targeted students regardless of their post-secondary education plans, with the hope of making the option to attend college more salient and for it to last longer (i.e. after the application deadlines and until the acceptance deadlines). This is reflected in the program's slogan: 'Keep Your Options Open'.

In the first round of the program (2011-12), senior-year students from randomly treated low-transition high schools attended three hour-long workshops in which they were guided through the college and financial aid application processes by trained external facilitators. In the first of the three workshops, students were presented with a list of colleges that they would likely be admitted given their high-school academic record, and were also walked through a financial aid calculator, showing students how they could afford to attend college. In the subsequent workshop, students completed – with assistance from teachers – their actual college applications, with the associated application fees waived. And finally, in the third workshop, students began applying for government financial assistance and were encouraged to send emails to their parents asking them to complete the last stages of the application. Again, personalized assistance was available to students in this final workshop.

As a result of the program, average college application rates for students in the 2011-12 cohort of treated schools increased by 22 percent, from 64 to 78 percent. This was driven predominantly by an increase in the application rates to two-year college programs and from students who were not enrolled in university-track high-school classes. For students not taking any 4-year college-track course, subsequent college enrollment increased 9 percentage points, again driven by enrollment into two-year colleges.

In an effort to determine which features of the program were most critical in increasing college application and enrollment rates, the program was administered again in 2013-14, altering the content of the treatments. In this second intervention, [Oreopoulos and Ford \(2016\)](#) find that the fee waivers were crucial to the initial success of the program; administering the program without including fee waivers appears to even decrease application and enrollment rates. Similarly, the structure and out-of-classroom scheduling that was a part of the initial intervention was likewise crucial; having students use laptops in their regular classroom (as opposed to moving to an IT lab) and condensing the first two sessions into one increased college application rates but had no impact on eventual enrollment. Finally, the second

installment of the program also found that simply providing high school teachers with instructions was equally as effective as hiring trained external facilitators. These variations in the program administration not only demonstrate that a high level of personalized assistance may be needed to affect application and enrollment rates, but also that fine details in the implementation of such programs matter substantially.

Another form of personalized assistance which researchers have trialed is mentoring. Mentoring involves partnering students with a coach who has a strong interest in their assigned students succeeding. It encourages trust building through long-term and personal relationships, and in turn can lead to mentors providing specific and thoughtful advice to their mentees ([Oreopoulos and Petronijevic, 2016](#)). While mentoring can take various forms, it is present in many successful adolescent-focussed interventions, and we believe it holds promise in assisting with the transition from high school to college.¹⁵

Specific to the college transition, [Carrell and Sacerdote \(Forthcoming\)](#) test the effectiveness of mentoring senior-year high-school students through their college applications. Students from high schools in the U.S. state of New Hampshire who were identified as having expressed interest in attending college, but had so far not applied, were randomly assigned to various treatment groups, wherein they received either a mentor, a \$100 cash bonus for completing the application process, or application fee waivers (or some combination thereof). There were accompanying control groups, and for the 2013 and 2014 cohorts, another treatment arm was introduced which sought to test whether students would be more inclined to apply to college if they received personalized letters from college admission officers encouraging them to do so. The program covered all aspects of the college application process, from writing college application essays, to initiating financial aid applications.

The most integral aspect of [Carrell and Sacerdote \(Forthcoming\)](#) is the explicit use of mentors. In the intervention, undergraduate Dartmouth College students were assigned mentees and would visit them at their high schools for up to three hours each week, assisting with all aspects of the application process, including outlining entrance essays. Mentors promised to continue their weekly visits until each mentee reached his or her college application goals. The Dartmouth mentors shared with their mentees their cell phone and email contact information. They also tracked each student's progress and administrative information, such as login usernames and passwords.

The mentoring intervention had a very noticeable impact on women's college enrollment rates, increasing enrollment into college by 14.6 percentage points, but a negligible impact on men's overall enrollment rates. Some subgroups of men treated did experience increases to enrollment, such as for non-SAT takers, but a substantial difference between the genders is persistent. One potential mechanism the authors explore using earnings data for New Hampshire is that men's after-high-school earnings potential is relatively higher than women's.

In contrast to [Oreopoulos and Ford \(2016\)](#), the increase in enrollment among women is driven primarily by enrollment into four-year – instead of two-year – college programs. A possible explanation for this difference may also lie in the two programs' sample selections. [Oreopoulos and Ford \(2016\)](#) targeted all students regardless of their initial college aspirations, whereas only students identified as having expressed a previous interest in attending college but had not yet applied were considered for the intervention in [Carrell and Sacerdote \(Forthcoming\)](#). This may have had the effect of predominantly moving students in [Oreopoulos and Ford \(2016\)](#) from not attending any college, to enrolling in a two-year college degree.

¹⁴ Low-transition high schools are schools in which less than half of graduating students typically enroll in college the following year.

¹⁵ For more information on the effectiveness of mentoring as a means to improve education outcomes – especially among younger students – we encourage the reader to review section 8 of [Mosso and Heckman \(2014\)](#).

Table 3
Interventions designed to combat summer melt.

Authors	Treatment	Data	Research design	Findings
Castleman and Page (2015)	Text message reminders and mentoring support to complete the college enrollment process.	Administrative data from Texas, Massachusetts and Pennsylvania, and the National Student Clearinghouse.	Field experiment	Students randomly assigned to receive text message reminders were 3 percentage points more likely to enroll in a two-year college (23 versus 20 percent). Treatment effects were largest for students with moderate high-school GPAs and less defined college plans.
Castleman et al. (2012)	Counselling to receive information and financial barriers to mitigate summer melt.	Administrative data from 7 high schools in Rhode Island.	Field experiment	Students randomly assigned to receive counselling were (i) 15 percentage points more likely to be enrolled in college full time (47 versus 32 percent); (ii) 15 percentage points more likely to be enrolled in a 4-year college (41 versus 26 percent); (iii) no more likely to be enrolled in a 2-year college; (iv) 19 percentage points more likely to have followed through with intentions from senior year (56 versus 37 percent).
Castleman et al. (2014)	Counselling to low-income high-school graduates to mitigate summer melt.	Administrative data from high schools in Massachusetts and Georgia.	Field experiment	Students randomly assigned to receive counselling were (i) 3.3 percentage points more likely to enroll in college in the fall (86 versus 82.7 percent); (ii) 5 percentage points more likely to be enrolled in college in their sophomore year (71 versus 66 percent).
Daugherty (2012)	Summer counselling to students in the Southwest U.S. who reported having applied to college, had been admitted to at least one college, and who were intending to enroll.	A school district student survey, administrative data providing information on demographics and college preparation exams, and data from the National Student Clearinghouse for college enrollment outcomes.	Difference in difference analysis of counselling intervention.	Difference in difference estimates suggest the intervention increased college enrollment by 2 percentage points. This result is driven primarily for students who intended to enroll and had been accepted to at least one four-year college. For students intending to enroll into a two-year college program, estimates suggest the intervention had little effect on the probability of enrollment.

And, conversely, students identified as having some aspiration in college in [Carrell and Sacerdote \(Forthcoming\)](#) may have been more likely to enroll in a two-year college in absence of the intervention, shifting treated students from a two-year college degree to a four-year college degree.

Regardless of the underlying mechanisms, together these differential results – both within and across the two aforementioned field experiments – demonstrate how details in program design matter, and how researchers must carefully consider what program design is most likely to elicit a response from their target population. Further to this point, the sensitivity in treatment effects to program design again supports the notion that behavioral factors play a role in students’ application decisions. That very small changes in program design – with no corresponding change in available information – engender meaningful change in students’ college application and enrollment outcomes suggests that students are not always carefully evaluating the true costs and benefits of applying for further education as the traditional investment model assumes.

2.3. Behavioral Interventions that target summer melt

The college and financial assistance application processes are not the only hurdles one has to surpass in order to matriculate to college. Over the summer months, many students who intend to enroll in college and who have already been admitted must complete paperwork pertaining to their coursework, housing, medical, and financial needs ([Castleman et al., 2014](#)). Some students also have to take additional placement tests. All of these hurdles must be overcome with less support than was available to the student while they were enrolled in high school. For many students, especially those from low-income and first-generation college families, these summer tasks can be challenging.

As suggested by the discrepancies between application rates and enrollment rates found in the field experiments discussed above, these summer hurdles can have a marked impact on college matriculation. Many senior-year graduates who successfully navigate the college and financial aid application processes, over the summer change plans or become dissuaded from actually matriculating. This phenomenon has become known as “summer melt”, and is present among a large proportion of students. Using data from the Educational Longitudinal Study of 2002, [Castleman and Page \(2014\)](#) estimates that roughly 15 percent of college-bound students from low-income families succumb to summer melt. This is compared to 10 percent for comparable students from high-income families.¹⁶ The authors further show – among a separate sample of graduating high-school students in Boston, Massachusetts – that this figure can rise to 22 percent for students in the poorest of families. As [Castleman et al. \(2014\)](#) notes, these estimates are consistent with other surveys and interventions among predominantly low-income school districts (e.g. [Daugherty, 2012](#); [Roderick et al., 2008](#)).

Qualitative evidence suggests that for many students, difficulties with parental relationships, instable resources, and a lack of knowledge regarding the enrollment process itself, are key to explaining the magnitude of this phenomenon. [Arnold et al. \(2009\)](#) proposes that students from low-income families need support over the summer in the form of expert guidance with the practical aspects of the college enrollment and financial assistance processes. The authors similarly advise ongoing social support for students throughout the summer so that they are equipped with the skills to adequately adjust to the college experience. To this end, researchers seeking to attenuate the phenomenon of summer melt have enacted large-scale field experiments,

¹⁶ The Education Longitudinal Survey is a nationally representative survey in the US conducted by the National Center for Education Services. It surveys students as they transition out of high school into either college or the labor market.

Table 4
Interventions designed to improve the match between students and colleges.

Authors	Treatment	Data	Research design	Findings
Avery (2010)	Randomly selected 52 of 107 high-school students to provide them with 10 h of personal college advising.	Student surveys	Field experiment	Although not statistically significant, treated students were 7.9 percentage points more likely to enroll in highly competitive colleges.
Avery (2013)	Tutoring and college application assistance.	Administrative data from the College Possible Program.	Field experiment	Students randomly assigned to the College Possible program were (i) 30 percentage points more likely to apply to a 4-year college; (ii) 44 percentage points more likely to apply to a selective institution; (iii) 15 percentage points more likely to enroll in a 4-year college.
Hoxby and Turner (2013)	Mailed semi-customised information on college options plus application fee waivers to high-achieving, low-income students.	Administrative data from 12,000 high-school seniors in the U.S.	Field experiment	Treated students (i) applied to 2.2 more colleges (6.9 versus 4.7); (ii) 40 percentage points more likely to apply to a selective college (92 versus 52 percent); (iii) 5 percentage points more likely to enroll in a selective school (8.8 versus 3.5 percent).
Borghans et al. (2015)	Advice from counselling while in secondary school on college program choices.	Survey data from more than 4000 high-school graduates in the Netherlands.	OLS and instrumental variables	Meeting with a high-school counsellor is associated with a reduction in the likelihood that a student wishes they had chosen a different program by 2 percentage points (20 versus 22 percent). Male students and students with parents defined to have low socioeconomic status are affected the most by high-school counselling.
Harackiewicz et al. (2012)	Parents were mailed two brochures and the link to a website that discussed the value of STEM courses.	Administrative and survey data from Wisconsin 10th and 11th grade students and their families.	Field experiment	Students of parents eligible for treatment enrolled in nearly 1 more semester of STEM courses than students of untreated parents (8.31 versus 7.50 semesters). Treated parents were 17 percent more likely to value STEM courses and 17 percent more likely to have conversations about the importance of advanced STEM courses with their children.

predominantly testing the effectiveness of an array of mentoring and coaching programs.

Castleman et al. (2014) run two large-scale field experiments testing the impact of summer counselling on college matriculation. Throughout the summer of 2011, 2373 graduating high-school seniors from schools in Boston, Massachusetts, and Atlanta, Georgia, were selected to participate in the field experiments. The experiments were implemented in collaboration with uAspire – a non-profit agency which provides financial aid advice and scholarships to high-school students – and the Fulton County School (FCS) district of Atlanta. As part of the experiments' interventions, uAspire counsellors offered coaching services to 927 students who had previously applied for a scholarship offered by uAspire, and FCS counsellors offered counselling to 1446 students from six schools among the FCS district. In both experiments, students were randomized into a control group and a treatment group, with the randomization occurring within schools in the FCS district.

Throughout the interventions, counsellors proactively reached out to students in the two treatment groups, offering support on issues pertaining to college enrollment. uAspire counsellors also encouraged students to meet for in-person coaching sessions.¹⁷ While the protocols followed by counsellors from the two organizations differed, their purposes were similar: counsellors from both uAspire and the FCS focussed on assisting students with issues pertaining to financial aid, meeting their college-related summer deadlines, and overcoming social and emotional barriers associated with college matriculation.

When conditioning on baseline covariates, students in the treatment groups were on average 3.3 percentage points more likely to matriculate in the fall. Moreover, these students were 5 percentage points more likely to still be enrolled in college during the first semester of their second year. Effects were larger for students from lower-income households. The lowest-income students from the uAspire treatment group were 12.3 percentage points more likely to enroll in college after the summer than their counterparts in the uAspire control group.

These results broadly indicate significant positive impacts of summer counselling for transitioning high-school students, especially those from low-income families, corroborating findings from other similar interventions – which are summarized in Table 3. With the programs' costs at less than \$200 per student, and the estimated financial returns to a college education for marginal students being significant, such programs appear worthwhile from a social planner's perspective. Even still, efforts to scale these initiatives in a low cost-manner have been underway to make such interventions more appealing to policy makers.

3. Section II – barriers to effective matching

Psychological or sociological barriers may exist not only for whether to go to college, but also where to go. Students that attend more selective schools often have more resources and support services available to them. Exploiting discontinuities in college admission processes, recent studies show large discrepancies in the returns to different fields of study and to the selectivity of college attended for students at the margin of admission (Kirkeboen et al., 2016; Hastings et al., 2014; Hoekstra, 2009). The studies point toward relatively larger returns to more selective colleges as well as to degrees in the sciences and business majors.¹⁸

Returns to college not only differ across field of study but within. Initial abilities, preferences, and available resources all affect expected

returns (e.g. Wiswall and Zafar, 2015; Stinebrickner and Stinebrickner, 2014; Denning and Turley, 2017; Sjoquist and Winters, 2015; Baker et al., 2017). Because of the heterogeneous returns to post-secondary education, in conjunction with increasing overall enrollment rates, researchers have become concerned with the 'match' between students and college programs, where 'match' is broadly defined as the partnering of students to college programs that would maximise their expected lifetime utility. Given differences in expected average returns, matching students with appropriate programs can have large consequences. Researchers' concern with this has risen in light of evidence showing that high-achieving students from low- and middle-income families tend not to apply to selective colleges that they might be admitted, even when the cost of attending such colleges is lower than less-selective alternatives (Hoxby and Avery, 2013; Smith et al., 2013; Roderick et al., 2009; Dillon and Smith, 2017).¹⁹

Table 4 lists interventions that have shown how details in the application process itself meaningfully impact the type and selectivity of college programs that students apply for and eventually enroll in. Access to application advice often differs across high schools, and application procedures can differ systematically across types of college programs, with more selective college programs often requiring students complete additional entrance exams and written submissions.

Goodman (2016) provides observational evidence showing how systematic differences in college application procedures can impact the types of programs students apply for and enroll in. In the U.S., college entrance exams such as the SAT and the ACT are typically required only for selective college admissions (Goodman, 2016); not writing the SAT or the ACT can automatically disqualify a candidate for admission from these colleges. Because of this, some U.S. states mandate students in the public-school system take at least the ACT. In assessing the effect of these mandates among two U.S. states, Goodman (2016) finds that for those induced to write the ACT, 40–45% scored marks high enough to be admitted at selective colleges. And, as a consequence, selective college enrollment increased by 20% – a result obtained by students substituting away from enrolling in less-selective colleges. Relatedly, Pallais (2015) shows how altering the number of free ACT test scores one can send to college admission committees has an extraordinary impact on the number of selective colleges low-income students apply for and enroll in. As with Goodman (2016), the response to this simple policy change favours the view that non-standard decision making processes play an important role in which college programs students choose to apply for and enroll in.

Avery (2010) and Avery (2013) show how counselling can increase the selectivity of colleges that students apply for. In Avery (2010), counsellors were paired with one or two students and ran up to a total of ten counselling sessions. In these sessions, counsellors assisted students choose which colleges to apply for and complete financial aid applications. Similarly, Avery (2013) evaluates the College Possible program – a two-year after-school program for high-school students which includes college entrance exam preparation, and college and financial aid application assistance. Both studies show that students who received counselling were more likely to apply to four-year colleges instead of two-year colleges.²⁰

Building off previous work showing that only a small fraction of high-ability, low-income students apply for selective colleges (e.g. Hoxby and Avery, 2013), Hoxby and Turner (2013) demonstrate how a simple intervention making the choice to attend a selective college more salient can have an impact on the selectivity of colleges that such students apply for and eventually enroll in. Very high SAT-scoring

¹⁷ Students in the control groups were not barred from receiving support from uAspire and FCS counsellors, but counsellors did not proactively reach out to these students.

¹⁸ Interestingly, the returns to different fields of study and to the selectivity of college attendance are intimately related, with students' chosen field of study appearing to account for much of the observed differences in the returns to attending more selective colleges (Kirkeboen et al., 2016).

¹⁹ Recent evidence also suggests that there is little 'over-match' of students from low-income families in selective colleges, providing further incentives for researchers and policy makers to encourage low-income, high-ability students to apply for selective colleges (Chetty et al., 2017).

²⁰ Results in Avery (2010) were not statistically significant, potentially due to the small sample size.

students from low-income backgrounds were mailed customised information and material about the application process and the colleges that they might be admitted to. The first treatment (the *Application Guidance* treatment) provided students with information on an array of colleges that the student may be accepted to, as well as reminders on the steps that the student ought to take to be admitted to those colleges. The second treatment (the *Net Cost* treatment) provided students with information on the expected net costs for typical low- to middle-income students to attend various colleges in the recipient's state, as well as for some out-of-state colleges. The third treatment (the *Fee Waiver* treatment) provided students with application fee waivers that did not require any paperwork to exercise. The fourth treatment (the *Parent Intervention* treatment) consisted of the materials in both the *Application Guidance* treatment and *Net Cost* treatment, but was tailored toward the parents of the family. Finally, the fifth treatment (the *ECO-C* treatment) combined the *Application Guidance* treatment, the *Net Cost* treatment, and the *Fee Waiver* treatment.

Students who were sent the *ECO-C* treatment sent out 19 percent more college applications than students in the control group. Students in this treatment group also applied to a greater range of colleges (as defined by median SAT scores of previously enrolled students), applying to at least one school with a median SAT score 34 points higher than they would have absent the intervention.²¹ Similar differences were apparent in college enrollment outcomes too: students in the *ECO-C* treatment group were admitted to 12 percent more colleges, and the most selective college they were admitted had a median SAT score 21 points higher than the most selective college the students in the control group were admitted.

The results of the *ECO-C* treatment were contrasted to the other four treatments in the 2011-12 cohort, showing which aspects of the *ECO-C* treatment were most important to students' application and enrollment decisions. Of the four, the results from the *Fee Waiver* treatment were most comparable to those of the *ECO-C* treatment; students in this treatment sent almost as many college applications and applied to similarly selective colleges to students in the *ECO-C* treatment group. The authors find smaller, yet still significant effects for the other three interventions on application outcomes for treated students. However, actual college enrollment outcomes are less impressive for students in these four treatments, relative to students in the *ECO-C* treatment. Furthermore, the *Net Cost* treatment had very limited effects on the type of college that students eventually enrolled in, supporting the proposition that providing information on the financial cost of college alone has little impact on students' transition from high school to college.

4. Section III – general mechanisms

The experiments discussed above suggest that students' college decisions do not always fit well with the predictions of traditional education investment models. What models better explain this behavior? This section considers three main possibilities: a lack of information, present bias, and inattention. The section concludes by noting that social influences also affect students' college investment decisions.

4.1. Information

A lack of availability and access to information on the expected net-benefits of attending college is one possible explanation for low college application and enrollment rates. In support of this hypothesis, studies show that simply providing students information on the net-benefits of attending college and on the financial aid that might be available to them has been successful in raising students' awareness of the true

²¹ Here, median SAT scores refer to the median SAT score that previously enrolled students for that college scored.

expected returns to a college education (e.g. Oreopoulos & Dunn, 2011; McGuigan et al., 2016; Dinkelman and Martinez, 2014; Fryer, 2016).

However, with some exceptions in developing countries (e.g. Nguyen, 2008; Jensen, 2010), effects of information-only treatments on college enrollment outcomes have been small or ineffective: in Bettinger et al. (2012), students in the treatment group which received only information on their estimated financial aid receipts did not increase their application or enrollment rates; for Hastings et al. (2015) and Busso et al. (2017), providing college-specific information about the average returns to college education did not increase Chilean students' enrollment rates; postal-mail interventions in Hoxby and Turner (2013) containing only personalized information on the cost of attending an array of U.S. colleges did not significantly affect college enrollment rates; and, lastly, providing information through email on available tax credits for attending college in the U.S. had no impact on application or enrollment rates of students in Bergman et al. (2016). The results of these experiments suggest that while students tend to lack full information on the net-benefits to attending college, access and availability of information is not critical to the low application and enrollment rates we often see among high-school students.

Yet, how information is provided and who provides it still matters. An important example is from Kling et al. (2012) who, in the context of prescription drug plans, show how providing information directly as opposed to simply making people aware of where they may find free easy-to-access identical information meaningfully affects the probability one changes their prescription drug plan. In the study, the authors sent one group of elderly patients a letter detailing how they could go onto the internet to receive a suggestion for the cheapest Medicare Part D plan given their personal drug profile, while another group was given this personalized information in the letter directly, so they did not have to go online. As a result, plan switching was 11 percentage points higher for those who were told directly in the letter what their cheapest plan was. Here, the salience of the information mattered for patients choosing between various options. The results from this experiment suggest that it is not simply the availability of information, but rather access to direct guidance and advice utilizing correct information that matters for such decisions. Given the general nature of the experiment, such considerations are also likely to extend to decisions centered around students' transition from high school.

4.2. Present-bias

Another possible explanation for low college application and enrollment rates is that adolescents tend to procrastinate and over-emphasise the immediate present (Lavecchia et al., 2016). In such a context, behavioral economic models incorporating time-inconsistent preferences are better suited to account for such behavior. For instance, when a student earnestly declares her intent to apply to college, yet chooses not to when faced with the immediate cost of completing the necessary paperwork, she appears to place a greater weight on earlier events as they move closer to the present. Models incorporating present-biased preferences – wherein agents discount the future relative to the present more than they discount the time between any two future periods (DellaVigna, 2009) – are better suited to predict these outcomes.²²

In many of the field experiments outlined in this paper students act as if they have time-inconsistent preferences. For example, students often appear to weight the immediate financial cost of applying for college more than can be reasonably predicted by traditional education investment models. Hoxby and Turner (2013) finds that among their postal-mail interventions which nudges students to apply for an array

²² For examples of such models, see Laibson (1997), O'Donoghue and Rabin (1999), and O'Donoghue and Rabin (2001).

of colleges, the application fee-waiver had the largest impact on students' outcomes. Similarly, the college application fee-waiver present in Oreopoulos and Ford (2016) was likewise critical to increasing college application and enrollment outcomes; removing the fee-waiver from the LifeAfterHighSchool program is even associated with lower application and enrollment rates relative to the control group. Further, reducing the non-pecuniary immediate costs of applying to college can have comparable impacts on application and enrollment outcomes; almost all interventions involving personalized assistance plausibly reduce the upfront costs of applying for college, and also tend to increase college application and enrollment rates very meaningfully. That such small changes to the upfront costs of applying to college affect student outcomes so substantially suggests students emphasise the immediate present more than can be reasonably predicted by traditional time-consistent education investment models.

However, if the main explanation for under-investment in college is present-bias, one would expect interventions encouraging students to focus on their future-selves to be effective in increasing application and enrollment rates. Yet, there is little evidence to support this proposition. For example, Fryer (2016) finds in a large-scale text messaging intervention that reminding students about the link between human capital and later-life outcomes has a negligible impact on students' education investment decisions. Similarly, in the context of academic achievement, Oreopoulos and Petronijevic (2016) finds that getting students to spend 60 to 90 min writing about their ideal futures and how their university education may assist them in realising this ideal has no measurable impact on college grades. Sending text messages and emails to a subset of these students reminding them of the resources available to them, and providing encouragement and motivation likewise did not affect academic performance.

Additionally, some of the most effective interventions outlined in this paper do not likely operate through making students consider their future more than they would absent the intervention. An example of this is the FAFSA experiment of Bettinger et al. (2012). In the experiment, treated families received personal assistance with the FAFSA submission process, but the benefits to submitting the FAFSA were not directly highlighted by the experimenters. Encouraging families to focus attention on the task at hand, and providing material assistance instead appear critical to the success of the experiment's main intervention. The same may also be said regarding the success of the interventions in Hoxby and Turner (2013). Since in this experiment all participants were already strongly considering the college investment decision,²³ it is difficult to attribute the increase in selective college applications to students focussing more on their future relative to the present.

4.3. Inattention

Our reading of the literature is that the likely explanation for the effectiveness of college application assistance is through inattention. Research in other studies shows how inattention – or lack of salience – can affect economic behavior in a variety of settings, from consumer purchases (e.g. Chetty et al., 2009), to retirement savings (e.g. Chetty et al., 2014; Madrian and Shea, 2001; Card and Ransom, 2011), and to organ donation registration (e.g. Johnson and Goldstein, 2003). The framing of decisions can matter as well, even when the consequences of alternative actions are significant; for instance, Madrian and Shea (2001) show that automatically enrolling employees into a workplace pension plan (as opposed to them actively choosing to enroll) increases participation in the plan by 38 percent, affecting employees' lifetime wealth meaningfully. Relatedly, recent research emphasises how one's ability to deliberate carefully upon decisions is influenced by their

available mental capacity (Mullainathan and Shafir, 2013), affecting the likelihood one abstains from making an active decision. Individuals' available mental capacity and their consequent ability to deliberate upon decisions is further understood to be influenced by external factors such as poverty and stress (Mani et al., 2013; Mullainathan and Shafir, 2013).

In line with this evidence, increasing the salience of the college application decision, and thus encouraging students to focus on the decision, is potentially crucial to the success of many of the field experiments promoting enrollment and appropriate 'matching' between students and colleges. This may be especially true for students from lower income families who are more likely to experience the cognitive burden that poverty imposes on their lives, and for whom the decision is not as salient because of circumstance; to this latter point, the decision to attend college may be discussed less among low-income and first-generation college-attending families. The differential treatment effects along income levels in the field experiments discussed supports this hypothesis.

By focussing students' attention on the college application decision, we anticipate students are more likely to make the optimal ex-ante decision. To this point, we understand students' true preferences to favour the outcome in which they apply for and enroll in college, and thus increase their expected lifetime wellbeing. Page et al. (2016) and Castleman and Page (2015) together provide evidence in support of this position. In the studies, text messages were sent to students reminding them of the actions needed to apply for financial aid and to enroll in college, throughout the academic year and throughout the summer after graduation, respectively. As a result, students submitted more FAFSA applications in Page et al. (2016), and were more likely to matriculate to college in Castleman and Page (2015). Since the upfront costs of applying for financial aid and enrolling in college were not changed, and since the additional information garnered from the text messages appear marginal, inattention seems a more likely mechanism underlying application decisions compared to present-bias or mis-information.

As with text message interventions, interventions involving personalized assistance or mentoring make the college decision more salient for students. By sitting with a tax professional to complete a financial aid application (e.g. Bettinger et al., 2012), or by meeting with a mentor to discuss the college application process (e.g. Carrell and Sacerdote Forthcoming; Castleman et al., 2014), students' attention is brought to focus on the college application decision. Students are encouraged to make an active decision: they are to choose between either adhering to the advice or guidance given to them, or not; the default option of taking no action is suppressed. Although harder to isolate the role of salience and attention in such interventions, it is likely that these mechanisms play an important role to explaining the large treatment effects resulting from personalized assistance and mentoring.

For this reason, education investment models incorporating aspects of bounded rationality, such as limited attention (e.g. Gabaix, 2014), may be better suited to predict the outcomes of students transitioning from high school. By highlighting the role that inattention and salience play in determining the outcomes of students transitioning from high school, such models can be helpful in constructing a coherent framework from which to infer public policy that is tailored toward adolescents for whom the decision to apply for and enroll in college is not always salient.

4.4. Social-influences

Returns to college may not be very salient to youth, but the desire to be liked is often top-of-mind. Concerns over social-image may therefore be overemphasized in determining students' college investment decisions. Tendencies to focus on how peers interpret one's actions, and whether one's consumption and investment choices command social attention plausibly affect many economic outcomes. For students

²³ All student participants in Hoxby and Turner (2013) had already written the SAT – a test required only for students intending to apply for college.

transitioning from high school, such concerns can be in conflict with pursuing further education; and, coupled with a focus on the immediate present, this conflict can encourage students to underinvest in their education.

Providing recent support to this hypothesis, [Bursztny and Jensen \(2015\)](#) conduct a field experiment among grade eleven students in Los Angeles, offering access to a complimentary online SAT preparatory course. In particular, the authors sought to manipulate students' beliefs about whether their choice to sign-up would be made public knowledge to other students in their classroom. Course sign-up sheets were randomly distributed within classrooms either telling students their choice to sign up would be kept private or would be made public to classmates. Importantly, the field experiment included both honours classes and non-honours classes.²⁴ Students in non-honours classes were 11 percentage points less likely to sign-up for the course when they received the sign-up sheet telling them their choice would be made public knowledge. These results were largest for students reporting that being popular is important. Conversely, sign-up rates for students in honours classes were not affected by the type of sign-up sheet they received.

[Bursztny et al. \(2017\)](#) demonstrate that while it is sometimes “smart to be cool”, it can also be “cool to be smart”, whereby intelligence is viewed positively by peers. The authors theorise that this latter mechanism can also reduce educational investment if students' investments reveal to peers an underlying low ability. To test the predictions of this theory, the authors conduct a similar field experiment as in [Bursztny and Jensen \(2015\)](#) across both low- and high-income schools, but make two important additions: first, they make receipt of the SAT course conditional on winning a lottery, where the probability of winning is randomized across participants;²⁵ and second, for students who win the lottery and for whom sign-up is observable to peers, SAT diagnostic test scores are likewise revealed, making underlying ability observable. The authors theorise that if students believe it is “cool to be smart”, when the probability of winning the lottery increases, sign-up rates should decrease among students for whom sign-up is publicly observable. This is because low-ability students are able to signal they are of high-ability by signing up for the SAT course (sign-up decisions are revealed regardless of the lottery outcome), but increase the risk of revealing their true ability when the probability of winning the lottery increases. Consistent with the model's predictions, for students in high-income schools – where the desire to signal high-ability is deemed more pervasive – sign-up rates for students where the decision to sign up is public decrease significantly when the probability of winning the lottery rises. These students act as though it is “cool to be smart”.

Together, these field experiments demonstrate the important role that social-image and peer pressure play for students making decisions important to the transition from high school to college. While these field experiments deal predominantly with educational investment decisions in advance of the decision to pursue a college education, they demonstrate the strong impact that peer groups can have on student behavior. What is disconcerting about the results of these field experiments is the differential impacts of peer groups across income levels. That different peer effects exist across income-levels confounds the trends we see among high-school students transitioning to college is particularly important for policy makers, and highlights the need to consider heterogeneity in interventions leveraging social pressure to encourage college enrollment.

5. Section IV – discussion

A common theme emerges from the experiments examined in this

²⁴ Students are typically placed into honours or non-honours classes based upon academic grades; students with higher grades are sorted into honours classes.

²⁵ Participants had either a low probability of winning (25%) or a high probability of winning (75%) the lottery.

paper: simplifying the college admission and enrollment process significantly increases application and enrollment rates. Many of the studies find quite similar results. For example, [Bettinger et al. \(2012\)](#) find that assistance for completing the FAFSA among a sample of graduating high-school seniors with a parent that went to H & R Block led to a 16 percentage point increase in application rates and a 8 percentage point increase in enrollment. [Oreopoulos and Ford \(2016\)](#) find that assistance for completing the college application among a sample of graduating high-school seniors from disadvantaged neighborhoods led to a 13 percentage point increase in application rates and a 5 percentage point increase in enrollment. [Carrell and Sacerdote \(Forthcoming\)](#) show that partnering selected high-school seniors from disadvantaged neighborhoods with undergraduate mentors who provide application assistance led to a 29 percentage point increase in application rates and a 5 percentage point increase in enrollment. And, [Castleman et al. \(2014\)](#) show that partnering college-bound students with a mentor through the summer prior to the start of college increases enrollment by 3 percentage points.

However, despite positive effects from simplification on application and enrollment rates, absent from most of these studies are records of longer-term effects, such as college completion and labor market outcomes. An example of a minor exception to this is [Bettinger et al. \(2012\)](#), which records students' persistence at college for three years after the study. The authors find that students whose families are provided with personalized assistance in submitting the FAFSA are 8 percentage points more likely to be enrolled in college for at least two consecutive years relative to students in the control group. Overall, though, whether students who are nudged into attending college are better-off because of such interventions remains an ostensibly open question. For this reason, we encourage researchers to pursue recording longer-term outcomes of interest.

Given existing reviews on pecuniary and non-pecuniary benefits to college, we believe positive returns associated with attending college are likely to extend to students who are induced into attendance because of a simplified and more salient application and enrollment process, even for students on the margin of admission. We do not believe all graduating high-school students should necessarily pursue a Bachelors degree, but rather that most students induced into attending college are better off for attending some type of post-secondary education institution compared to stopping at high school. Crucially, in all the interventions discussed, the choice of whether to attend college remains open for the student, helping ensure that for those students who would be disadvantaged by attending college, the option to forego college is just as available as it was prior to any intervention. For these reasons, we believe the ex-ante decision to simplify and make salient the application and enrollment process is clear.

The concern surrounding whether students are better off for being nudged into attending college raises an interesting point highlighted in [Sunstein \(2014\)](#): all application and enrollment processes are embedded in a policy framework which affects the ease by which students transition from high school to college; and, the kinds of behavioral interventions discussed above can be conceptualised as conscious efforts to institute alternative policy frameworks which make it more likely that some transition to college as opposed to the alternative of leaving existing policies in place, where fewer students are likely to make that transition. While unlikely in either case that all students are pushed toward making the optimal investment decision, the policy in place affects access. A decision should be made whether to prefer one option that encourages matriculation, versus the other that discourages it.

The studies reported in this paper highlight that the best approach to simplify and make salient the college application and enrollment process depends on context and cost, and that details in intervention design matter. Moreover, most of the studies are very recent and many of the interventions involving personalized assistance have been conducted in North America, leaving open the possibility that some

of the studies' findings might not apply to other time periods and countries. For this reason, we encourage researchers to demonstrate proof of concept for scale-up. In demonstrating the potential for an intervention to be scaled up, researchers leave open the possibility for successful studies to be closely replicated on a large scale, attenuating issues associated with deriving external validity from interventions which are context specific and sensitive to experimental parameters. This is not to say that generalizable mechanisms cannot be drawn from researchers' experiments, but this approach may perhaps be thought of as 'best practice' for researchers in the field.

Some interventions examined, like simplifying the actual college and financial-aid application process, texting reminders to apply, or getting students to watch a video in class are extremely cheap. Even with only a 1 percentage point impact on college completion, they are likely cost-effective and provide easy opportunities to demonstrate the potential for scale-up. Other interventions involving application fee waivers or personal assistance are more expensive and require a more careful cost-benefit analysis. Relative to other efforts to improve college access, however, most of the programs examined here are inexpensive, making it very feasible to scale effective nudges.

Comparing the details and effectiveness of the experiments discussed in this paper provides insight about possible mechanisms explaining students' application and enrollment decisions. Interventions encouraging students to focus on their future-selves have, for the most part, been ineffective in changing college investment decisions. Rather, interventions that simplify and make salient the college application process are more effective. We believe that the best model to explain these results is one where some students are inattentive to their college possibilities and therefore let opportunity slip by. By simplifying and making more salient the college application process, researchers target this tendency, encouraging students to deliberate upon the college investment decision more carefully. Such interventions won't help address all the harsh realities from growing up poor, from being exposed to low expectations, or early childhood adversity. But making the decision more salient for students and enabling smoother transitions to higher education may be considered in isolation as an approach to help keep postsecondary options open and prevent some exiting high school from falling through the cracks.

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