Closing the Gap: The Effect of a Targeted, Tuition-Free Promise on College Choices of High-Achieving, Low-Income Students

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Abstract

Low-income students are unlikely to attend a highly selective college even when they have strong academic credentials. Changing this has the potential to improve college graduation rates and reduce income inequality. With a field experiment, we test an intervention intended to increase the enrollment of low-income students at the highly selective University of Michigan. We contact students (as well as their parents and principals) with an encouragement to apply along with a promise of four years of free tuition and fees upon admission. Materials emphasize that this offer is not contingent on completing aid applications (e.g., the FAFSA or PROFILE). Nearly all admitted students eventually completed aid applications and qualified for more than the promised tuition waiver. Treated students were more than twice as likely to apply to (67 percent vs. 26 percent) and enroll at (27 percent vs. 12 percent) University of Michigan. There was no diversion from schools as (or more) selective as UM; the enrollment effect of 15 percentage points (pp) comprises students who would otherwise attend a less selective four-year college (7 pp), a community college (4 pp), or no college (4 pp). Enrollment effects persist through two years of follow-up. The intervention closed by half the income gaps in college attendance and selectivity among Michigan's high-achieving students. We conclude that an encouragement to apply, paired with an upfront promise of aid, when communicated to both students and influential adults, can substantially reduce socioeconomic differences in college choices.

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1 Introduction

Gaps in educational attainment between low- and high-income students are large and have grown in recent decades. Among children born in the 1980s, those from the bottom quartile of family incomes were 50 percentage points less likely to attend college than those from the top quartile. And while 54 percent of children born into the top income quartile earned a bachelor's degree, only nine percent of those in the lowest quartile did so (Bailey and Dynarski 2011).

These differences stem in part from disparities in academic preparation. But even among well-prepared students, there are substantial gaps in college enrollment and the quality of college attended (Hoxby and Avery 2012). Combined with evidence that college quality increases both educational attainment and earnings (Hoekstra 2009; Zimmerman 2014; Dillon and Smith 2018), the under-representation of low-income students at selective colleges likely exacerbates both educational and income inequality.

Among high-achieving students, differences in application behavior drive income differences in college quality. Hoxby and Avery (2012) find that the majority of low-income, high-achieving students apply to no selective schools, even though doing so would likely lower their costs (Cohodes and Goodman 2014), increase their chances of completing a college degree, and increase their future wages (Hoekstra 2009, Zimmerman 2014; Andrews et al. 2016).

We use a randomized, controlled trial to test whether an inexpensive, targeted, personalized outreach campaign can alter the college decisions of low-income students. The intervention, the "HAIL (High Achieving Involved Leader) Scholarship,"[1] was designed to address three issues that research shows affect the college choices of low-income, high-achieving students: uncertainty about their suitability for an elite school, over-estimates of the (net) cost of college, and procedural barriers such as financial aid forms.

In a personalized mailing, students were encouraged to apply to the University of Michigan (the state's most selective college) and promised four years of free tuition and fees if admitted, with no requirement to complete financial aid forms.[2] Parents and principals of the eligible students were also personally notified about this offer.

Students in the study would have been eligible for at least free tuition and fees in the absence of this intervention. We examined the aid packages of similar University of Michigan students and found that 90 percent received full tuition scholarships (in-state tuition is $14,000). The intervention therefore informed students about aid for which they were already eligible. It also reduced uncertainty

[1] The acronym "HAIL" is a reference to the University of Michigan's fight song. "HAIL Michigan" is plastered on t-shirts, bumper stickers, water bottles, tube tops, underwear, beer coolers, dog coats, and billboards across the state and beyond. Go Blue!

[2] Barron's ranks schools from "least competitive" to "most competitive" based on a combination of average GPA, SAT scores, and acceptance rates. "Very competitive" combines the top two categories (highly competitive and most competitive). The University of Michigan is in the "highly competitive" category.

with its four-year, early commitment. Previous studies that have provided only information about aid eligibility, with no similar commitment, have had zero to small effects on behavior (Bettinger et al. 2012; Bergman et al. 2017).[3]

Target students were identified using administrative data from the state of Michigan. Rising seniors enrolled in Michigan public schools who are eligible for free- or reduced-price school meals and have sufficiently high scores and grades (described in Section 5) comprise the sample. Each year, about two thousand students meet these criteria.

We find very large effects of the HAIL scholarship offer on application and enrollment rates at the University of Michigan and more generally on college choice. The likelihood of application to the University of Michigan more than doubled, from 26 percent among controls to 67 percent among students offered treatment. The share enrolling at *any* highly selective college more than doubled, from 13 percent to 28 percent, with this effect operating completely through enrollment at University of Michigan.

One-quarter of the enrollment effect (four percentage points) is driven by students who would not have attended any college in the absence of the treatment. The balance would have attended a community college or a less selective four-year college in the absence of the treatment. The offer of the scholarship diverted no students from colleges as or more selective than the University of Michigan – that is, there was no "poaching" from similarly (or more) selective schools. Nor was there any *increase* in attendance at other selective schools, which plausibly could have resulted from mailings that informed students that they were strong candidates for admission to University of Michigan.

The magnitudes of these effects are much larger than those in previous interventions with similar goals (Hoxby and Turner 2013; Bettinger et al. 2012; Bergman et al. 2017; Goldrick-Rab et al. 2016). Several dimensions of the HAIL intervention set it apart from previous studies, and plausibly explain the size of its effect.

First, the HAIL Scholarship provides an unconditional promise of four years of free tuition. This commitment may reduce uncertainty to students and parents who may know little about aid and doubt a student is eligible for aid from a competitive college. Interventions that provide only information about aid eligibility have generated zero to modest changes in college enrollment (Bettinger et al. 2012; Hoxby and Turner 2013).

Second, the intervention notifies parents and school principals, as well as students, about the scholarship. Parents receive a letter about their child's eligibility a few weeks after the student does. We see distinct spikes in activity at the dedicated, online HAIL portal soon after the separate student

[3]While submitting aid forms was not required to receive the HAIL Scholarship, applicants were encouraged to do so. Admissions staff prodded admitted students to complete forms, and 95 percent of the admitted HAIL Scholars did so.

and parent mailings.[4] The parent and principal mailings could change the minds of adults doubtful that a student can get into (or afford) a selective school, or inspire already supportive adults to assist students in applying. We cannot pinpoint the precise mechanism given our current design but hope to experimentally vary the parent/principal communications in the future.

Third, we would expect the offer of a scholarship from the University of Michigan would have a particularly large impact in Michigan. The school is very well known in the state, in part due to the prominence of its football team. The large, heavy, glossy, maize and blue package made its connection to University of Michigan clear. In previous interventions, mailings sent in plain envelopes from an unrecognized source were largely ignored or disregarded as fraudulent (Hoxby and Turner 2013; Goldrick-Rab et al. 2016). In a state with a less prominent flagship, or with a more crowded market of highly selective schools, students' application behavior may be less responsive to an analagous intervention.

Finally, we hypothesize that Michigan's universal college testing program, and our use of state administrative data to identify prospective applicants, contribute to the program's large effect. All students in Michigan's public high schools are required to take the SAT (previously the ACT), which is administered for free, during school hours, in a student's own school. Universal testing increases the share of disadvantaged students who take college entrance exams, including many who end up scoring quite well (Hurwitz et al. 2015; Bulman 2015; Hyman 2017). In Michigan, the introduction of universal testing increased the share of students attending and graduating college (Hyman 2017).

It is plausible that students who would not sign up for a voluntary college entrance exam (and so would be missed by recruitment programs that rely on voluntary testing) would tend to be misinformed about their aid eligibility (and suitability for a selective college) and therefore responsive to the HAIL offer. And students' HAIL eligibility was determined using transcripts and data on subsidized-lunch eligibility contained in state databases, rather than the student-reported information on the SAT survey used by most colleges (and interventions) to identify prospective applicants.[5] It is plausible that students who would skip or incorrectly answer a question about family income or GPA on a survey would tend to be misinformed about their college options.

Our results show a low-cost intervention can profoundly alter student application to and enrollment at highly selective colleges. In ongoing work, we track the effects of the intervention on college major, persistence, and graduation. In the long term, we plan to examine the effect of the program on earnings and other measures of well-being. We hope to test HAIL-like programs in other settings and welcome collaborations with scholars, college adminnistrators, and policy actors who

[4]The student mailings include a personalized web address for accessing more information about the scholarship and to request free University of Michigan swag. This allows us to track web activity for a particular student. We cannot track the effect of communications with principals in the same way, since we contact them before we send students their personalized packet.

[5]Previous research indicates students are inaccurate in these self-reports and that, more generally, administrative data can be more accurate than surveys (Moore et al. 2000; Meyer et al. 2015).

wish to test this approach in their own backyards.

2 Background

2.1 Income Gaps in College Quality and Why They Matter

A long literature informs the design of the HAIL Scholarship and our understanding of income-based gaps in college-going.

Using administrative tax data for the entire United States, Chetty et al. (2017) find that just 12 percent of college students come from the bottom fifth of the family-income distribution, while 28 percent are from the top fifth. This imbalance is yet larger at the most selective colleges.[6] Those schools have more students from the top 1% of the income distribution than from the entire bottom half.

Undermatching, with students attending institutions with average test scores significantly below their own, accounts for some of this gap in college selectivity. Students are said to undermatch when they are much more skilled than their peers at an institution and could therefore have attended a more competitive school. Only 38 percent of Chicago Public Schools students who qualify for very selective colleges attend them (Roderick et al. 2011). Similarly, Bowen et al. (2009) found that, among students in North Carolina in 1999, 40 percent did not attend the higher-tier institution for which they were likely eligible given their academic performance. This concurs with a study of two, nationally-representative cohorts of high school graduates from 1992 and 2004 (Smith et al. 2013).

Hoxby and Avery (2012) and Dillon and Smith (2017) find that the main driver of mismatch is application choices rather than admissions decisions. That is, low-income students wind up at schools of lower selectivity not because they were rejected from the better schools but because they never applied in the first place. Dillon and Smith find that among the students who undermatch, 72 percent applied to no closely matched college and just 6 percent applied to such colleges but were rejected. Hoxby and Avery (2012) show that many very qualified students apply to no selective colleges at all.

In Michigan, as in the rest of the country, there are large differences in college choices between low- and higher-income students. Among students whose academic achievement makes them plausible candidates for University of Michigan, low-income students are four percentage points less likely to attend *any* postsecondary institution than their similarly-qualified, higher-income peers (see Figure 1). Gaps in college selectivity are yet wider than gaps in college attendance: low-income

[6]The authors refer to these institutions as the "Ivy Plus" and include the eight ivy league schools plus MIT, Stanford, Duke, and the University of Chicago.

students are 8 percentage points less likely to attend a highly selective (e.g. the University of Michigan) or most selective institution.

More selective institutions typically offer more aid to low-income students, making them cheaper than less selective schools (see Table 1). Students from Michigan with family incomes between $30,000 and $48,000 pay $6,600 out-of-pocket to attend the University of Michigan, compared to $11,900 at Michigan State University and $10,800 at Eastern Michigan University. For a Michigan resident, only a community college is (at $4,000) a cheaper option than the University of Michigan.

Graduation rates and average salaries in adulthood rise with college selectivity. As we discuss later, research indicates that at least part of this relationship is causal. The University of Michigan has a 90 percent graduation rate (within six years) and an average alumni salary of $60,000 (within ten years of attendance). The comparable statistics at nearby Eastern Michigan University are 38 percent and $37,500 .

2.2 Interventions to Reduce Income Gaps in College Choices

Researchers have tested the effect of providing students with information about schools that match their achievement, as well as the net cost of those schools.[7]

Hoxby and Turner (2013) show that a relatively light-touch intervention informing students of both their qualifications and the cost of attendance increased a student's likelihood of applying to and attending a college that matches their qualifications. Sample students scored in the top 10 percent of the ACT or SAT and bottom third of the income distribution. Students received information about colleges that matched their qualifications (including detailed information about how to apply) and expected financial aid. The intervention led to a 12 percentage point increase in applications, and a five percentage point increase in enrollment, at schools that matched the qualifications of these high-achieving students.

Carrell and Sacerdote (2017) found that a program that assisted students in choosing and applying to college increased attendance of women by 15 percentage points, with much smaller effects for men. The mentoring intervention consisted of assigning Dartmouth undergraduates to help high school seniors through the process of applying for college and aid. Providing financial incentives or information alone had no effect on college enrollment, though removing the financial incentive decreased by a third the share of students who volunteered for the experiment. The authors hypothesize that the mentoring program served as a substitute for parental and teacher support in the application process.

[7] Deming and Dynarski (2017) and Dynarski and Scott-Clayton (2013) review evidence on the effect of financial aid on college attendance, while Page and Scott-Clayton (2016) review interventions that operate through informational and behavioral channels. Providing students with information about the returns to college has increased college attendance in previous evaluations (Oreopoulos and Dunn 2013; Hurwitz and Smith 2018).

Two recent studies have examined the effect of institution-specific, financial aid and student supports on college attendance, persistence, and completion in the US (Clotfelter et al. 2018; Andrews et al. 2016). Both found increases in persistence and college completion among cohorts of students exposed to the programs. Clotfelter et al. (2018) analyzed the impact of the Carolina Covenant, a program combining financial with non-financial supports for low-income students attending an elite public university, the University of North Carolina at Chapel Hill. Using a difference-in-differences design, they found that students eligible for the Covenant were eight percentage points more likely to complete college in four years, compared to similar students who were not eligible for the program. Andrews et al. (2016) also use a difference-in-differences design to show that the Longhorn Opportunity Scholars program increased low-income student attendance at the state's flagship (University of Texas-Austin) by 2.2 percentage points. The authors also found the program produced significant gains in earnings.

Colombia introduced the *Ser Pilo Paga* (in Spanish, "Being a Good Student Pays Off") national scholarship in 2014. It covers tuition and living expenses (in the form of a loan forgivable upon graduation and a biannual stipend) at a set of qualifying high-quality universities. All students below a socioeconomic threshold and above an achievement threshold on the national high school exit exam were eligible. Exploiting the eligibility thresholds, Londoño-Vélez et al. (2017) found that low-income college enrollment doubled, eliminating the income gap among high-achieving students. On the intensive margin, the scholarship shifted the eligible students into higher quality institutions.

Finally, a strand of research investigates the effect of simplifying or assisting with the financial aid process (e.g. Bettinger et al. 2012; Castleman and Page 2016). Bettinger et al. (2012) found that assistance with federal aid forms increases the likelihood of completing two years of college by eight percentage points but that information alone, even if highly personalized, had zero effect.

The HAIL intervention builds on previous interventions in a number of ways. Our approach is similar in spirit to the Hoxby and Turner (2013) intervention, in that we provide personalized information on financial aid eligibility to high-achieving, low-income students. HAIL differs from the Hoxby and Turner (2013) intervention in that a guarantee of aid is offered and communications come from the college itself rather than a third party. As Hoxby and Turner (2013) hypothesize, this may lend added credibility to the offer. HAIL also involves parents and principals in the treatment.[8] Including parents and principals in the HAIL intervention likely lends more credibility to the student packet and may induce adults to provide support in the application process.

[8]Interventions that involve parental contact have proven effective in increasing attendance (Smythe-Leistico and Page 2018) and achievement (Bergman 2015) among elementary school students.

3 Intervention

Together with administrators at the University of Michigan at Ann Arbor, we designed the HAIL scholarship as a low-cost way of recruiting low-income, high-achieving students across the state. In this section we describe the intervention, while in a later section we describe the sample and research design.

Michigan is large, with a thousand public high schools, many in remote rural areas. HAIL was designed to personally reach out to students in a cost-effective manner (each packet cost less than $10 to produce and deliver). The intervention had several goals: inform students about financial aid; provide a four-year guarantee of aid; and tell students that they can succeed at an elite school like the University of Michigan.

Students in the treatment group received personally-addressed packets at their homes in the first week of September of their senior year of high school.[9] Students in the control group received only postcards listing University of Michigan application deadlines. The treatment materials, designed by admissions staff, were large, glossy, and brightly colored, to reduce the likelihood that students would discard the packets without opening them. The packets were 9 inches by 12 inches, on thick paper, and printed in the university's signature "maize and blue" (see pictures in Appendix A.1).

Inside the packet, a letter from the president of the University of Michigan encouraged the student to apply and offered a promise of a four-year, full-tuition-and-fees scholarship (prominently valued at $60,000) if the student was accepted. The packet also contained a flyer describing the application and admissions processes, brochures describing the University of Michigan experience, and coupons for fee waivers for the Common Application, the Free Application for Federal Student Aid (FAFSA), and the CSS profile.[10]

Materials stated prominently that applicants did not have to complete the FAFSA or the CSS profile to get the HAIL scholarship, though they were encouraged to do so in order to obtain even more aid. The letter encouraged students to apply to University of Michigan by the early action deadline of November 1, although applicants would still be eligible for the scholarship if they applied by the regular deadline of February 1. University of Michigan admits most of its incoming class through early action, so students have the best chance of being admitted if they apply by November 1.

Information about this offer was also mailed to parents, and e-mailed to principals, of eligible students (see Appendices A.2 and A.3). Letters to parents, mailed two weeks after the student packets, encouraged them to help their children apply and described the scholarship. Communications

[9] In the second year of the intervention, student packets were not mailed until early October due to data and printing delays.

[10] Application to the FAFSA is free, and these students would have been eligible for fee waivers without the coupons. We included the coupons to emphasize this point and make it more salient.

with principals, sent in late August, explained the program, listed eligible students, and asked the principal to encourage eligible students to apply.

3.1 Evidence of HAIL Awareness from Website Activity

The student packets included personalized web addresses that allow us to track whether and when a student logs onto a website that describes the HAIL Scholarship, and University of Michigan, in greater detail. To encourage them to go to the site, students were offered a free University of Michigan t-shirt. About 40 percent of students offered HAIL visited the website at least once. Among students who visited the website, the average number of views was 5.5 with a median of three.

Most first-time visits to the website occurred in the days after student and parent letters were mailed (Figure 2a). There is a spike in first-time visits a few days after the student letter is mailed and another spike of similar magnitude when the parent letter goes out. This suggests that some parents prodded their children to log onto the website. There is little new activity after the early-action deadline of November 1.

The pattern is similar for the second cohort, though the timing of the mailings differs (Figure 2b). In the second year (due to delays in printing packets) the student and parent letters were sent only three days apart in early October, so it is difficult to observe the effect of the student letter separately from that of the parent letter.

Figures 3a and 3b show the total number of visits to HAIL websites over time for the first and second HAIL cohorts, respectively. As with first-time views, all views spiked following the student and parent mailings and fell after the early-action deadline. Although few students visited their websites for the first time after November 1, there was a steady stream of page views (up to 32 per day in the first year and up to 18 in the second), implying that a number of students returned to the site after the deadline had passed.

4 Data

We use longitudinal, student-level, administrative data from the Michigan Department of Education (MDE) and the Michigan Center for Educational Performance and Information (CEPI) to identify the set of students in public high schools who are prospects for admission to University of Michigan. The state database contains information on students, from kindergarten through high school, in Michigan public schools. These datasets are linked by a common student identifier. The data contain student characteristics such as race, ethnicity, gender, and eligibility for subsidized meals.

Since 2007, all students attending public schools in Michigan take the ACT as part of their 11th-grade standardized test. We use scores from this in-school test in assigning eligibility for the HAIL Scholarship. Students take the exam in the spring of their junior year. In the 2015-16 school year, which corresponds to the second cohort of our intervention, the state switched to the SAT.

Students' transcripts allow us to calculate grade-point average in high school. We compute GPA using a four-point scale, based on grades at the end of tenth grade (the latest data available in the summer after eleventh grade, when we randomize).

We use internal data from the University of Michigan to measure application and admission to the school. We are unable to observe application and admission for schools other than University of Michigan.[11] The University of Michigan data also includes enrollment and persistence. We use data from the National Student Clearinghouse (NSC) to track enrollment nationwide, including college names and dates of attendance (Dynarski et al. 2015).

5 Sample Selection and Randomization

The target population for HAIL is high-achieving, low-income, rising seniors in Michigan's public schools.

We measure income using participation in the federal subsidized-lunch program. Students are eligibile for subsidized meals if their family income is below 185 percent of the federal poverty line. In 2015, this threshold corresponded to $44,863 for a family of four.[12]

After identifying all low-income students who are rising seniors, we use high school GPA and score on the college-going exam (ACT or SAT) to select the sample. Admissions officials at the University of Michigan set these GPA and score cutoffs.[13] Qualifying ACT (SAT) scores start at 22 (1100) while qualifying GPAs start at 3.3. Students with higher test scores faced a lower GPA threshold (and vice versa).

Of the 100,000 juniors in Michigan's 1,000 public high schools, about 2,000 in 500 schools met the income and academic criteria in each of 2015 and 2016: 2,108 students from 529 schools for the first cohort and 1,802 students from 497 schools for the second.[14]

We assigned treatment status at the level of the high school in order to reduce the likelihood that students in the control group would learn of the program from a classmate in the treatment

[11] Data from the Common Application would be ideal for this purpose.

[12] In Michigan, students automatically qualify for subsidized meals if their family receives means-tested benefits such as food stamps or TANF. Qualification occurs through a data match between the education and human services administrative systems.

[13] Grades and scores do not determine admission; like most highly selective colleges, the University of Michigan uses multiple criteria, including extracurricular activities, to decide who gets in.

[14] Pooling the two cohorts, 28,267 juniors met the academic criteria but not the income requirement, while 52,377 students met the income requirement but did not meet the achievement criteria.

group. Schools in the sample were dispersed throughout the state. While there were concentrations of schools in the major metropolitan areas, there were also many schools in the Upper Peninsula and in the rural areas of the state (see Figure 4). Many students in the sample were the only student in their school meeting the HAIL criteria. The median school in our sample had three students meeting the HAIL eligibility criteria and the mode was one student (see Figure 5).

Based on previous research (Hoxby and Turner 2013) we hypothesized the program's effect might vary by the number of high-achieving, low-income students in a school, with more isolated students responding most intensely. We therefore stratified the sample (into four groups) by the number of HAIL-eligible students in each school, then randomized within each stratum.[15]

For the first cohort, the randomization resulted in 1,057 treated students and 1,051 control students in 262 treated schools and 267 control schools. In the second cohort, 875 students in 238 high schools were in the treatment group, while 927 students in 259 high schools were in the control group.

5.1 Sample Characteristics and Balance Tests

Sample characteristics are shown in Table 2. The table also shows tests for balance (within each cohort-stratum) between treatment and control groups. We perform two-way t-tests as well as regressions predicting assignment.

Forty percent of the schools in the treatment and control groups are in the Southeast region of the state, where Ann Arbor, Lansing, and Detroit are located. An additional 46 percent of schools are in the West Central region of the state, home to Grand Rapids. The remaining 14 percent of schools are in the largely rural Upper Peninsula. A third (35 percent) of schools are in suburbs, 12 percent in cities, and the remaining 54 percent in rural areas.

A majority of HAIL-eligible students are female (59 percent) and white or Asian (84 percent). Nine percent are black and seven percent Hispanic, American Indian, or native Hawaiian.[16]

The majority of students in the sample qualified for a free lunch (70 percent) while the remaining 30 percent qualified for a reduced-price lunch. The average student had a 3.8 GPA and scored a 1257 on the SAT (or ACT equivalent), placing them between the 86th and 87th percentile of the national distribution (College Board 2016).

[15] For the second cohort, schools that had newly entered the sample (because they had no eligible students in the first cohort) were randomly assigned using the same method. Some schools in the first cohort had no eligible students in the second cohort. See Appendix Table 1 for details on how many schools were in the sample for each cohort.

[16] We group students into three race/ethnicity categories: white or Asian, black, and other. Race categories are mutually exclusive. "Other" includes Hispanics, American Indians, Alaska Natives, Native Hawaiians, and other Pacific Islanders. Students are coded as Hispanic if they identify as Hispanic, regardless of race. For students of multiple races, a single race category is assigned according to the following hierarchy: black, Native American, Asian, Hawaiian/Pacific Islander, white.

Just over a third of the sample sent their ACT/SAT scores to the University of Michigan when they took the test. Six percent of all seniors in the study schools applied to the University of Michigan in 2015, the last year before the intervention.[17] Treated schools had slightly lower rates of application in 2015 (5.5 percent compared to 6.7 percent) and were slightly smaller (an average of 175 students in an 11th grade cohort compared to 189 students among control schools). We find no other significant differences between the treatment and control group using two-way t-tests. Given the number of covariates analyzed, the number of significant differences observed in Table 2 is consistent with chance.

An F-test shows the coefficients predicting treatment status are jointly significant, likely due to the differences in class size and share of prior cohorts applying to the University of Michigan. Since (at baseline) students in treatment schools were less likely than those in control schools to apply to the University of Michigan, any bias from imbalance will tend to attenuate estimates toward zero. As we show in the results, our key estimates are not sensitive to controlling for these variables.

6 Empirical Strategy

We evaluate the effect of the HAIL scholarship on application, admission, enrollment, and persistence by comparing outcomes between students in the treatment and control groups. We estimate the following models by ordinary least squares (OLS):

$$Y_{jt} = \beta_0 + \beta_1 D_j + \beta_2 S_{jt} + u_{jt} \tag{1}$$

$$Y_{jt} = \gamma_0 + \gamma_1 D_j + \gamma_2 S_{jt} + \gamma_3 Z_{jt} + u_{jt} \tag{2}$$

where Y_{jt} is an outcome of interest at school j for cohort t. We collapse the individual student data to the school-cohort level and conduct analysis on these means. Y_{jt} is therefore the share of HAIL-eligible students in school j in cohort t that applied, were admitted, or enrolled. D_j is an indicator variable equal to one if the school is randomized to the treatment group and zero if the school is randomized to the control group (note that schools keep their randomization status from the first cohort in the second cohort). S_{jt} is a vector of strata-by-year dummies; recall we stratified the sample by the number of HAIL-eligible students in the school for each cohort. Z_{jt} is a vector of control variables measured at the school-cohort level.

Following Bruhn and McKenzie (2009), given pure randomization with strata, we estimate (1) and we additionally consider (2) where the control variables are included to improve the precision of the estimates.

[17] Note that this statistic is for all students in the study schools, not just the low-income, high-achieving students who are the focus of the study.

β_1 and γ_1 are the parameters of interest and measure the causal effect of being randomized into the treatment group, i.e. the estimated effect of the Intent to Treat (ITT). These parameters represent the treatment effect on the outcomes of interest, with schools weighted equally. Estimates are similar when weighted by the number of sample students in each school.

Since we observe the outcomes for all students, and therefore all schools, there is no attrition due to non-response. We do not observe whether a student actually receives the information packet (i.e. is effectively treated), and students assigned to the control group cannot be treated, so we do not adjust for non-compliance.

We conduct subgroup analyses to check for heterogeneity in the treatment effect.[18] We examine variation in effects by region (Southeast, West Central, Upper Peninsula), urbanicity (suburb, city, town/rural), number of HAIL students in the school, and the school's baseline application and enrollment rates to University of Michigan. Additionally, we evaluate heterogeneity by gender (male vs. female), race (white/Asian, black, other), whether the student sent test scores to the University of Michigan, and whether the student is eligible for free (rather than reduced-price) meals in school.

These subgroup analyses help to identify the potential mechanisms through which HAIL affected application and enrollment. Previous research suggests that low-income, high-achieving students who have few similar peers are less likely to attend selective institutions than those who are surrounded by similar peers (Hoxby and Avery 2012). Of particular interest is whether the HAIL scholarship was effective in raising application and enrollment rates among these isolated students, which we evaluate based on the region, urbanicity, the number of HAIL eligible students in the school, and whether the student sent their test scores to University of Michigan.

Similarly, research has suggested that a high school's prior ties with a school predicts whether a student will attend (Hoxby and Avery 2012). We test this hypothesis by evaluating heterogeneous treatment effects as a function of schools' baseline application and enrollment rates at University of Michigan at Ann Arbor.

7 Results

7.1 Application, Admission, and Enrollment at the University of Michigan

Students in treated schools were substantially more likely to apply to, gain admission to, and enroll at the University of Michigan at Ann Arbor than those in control schools (see Table 3 for regression estimates and Appendix Figure 1 for treatment and control means). At control schools,

[18] We show tests for balance in these subgroups in Appendix Table 2.

26 percent of low-income, high-achieving students applied to University of Michigan, compared to 67 percent at treatment schools. That is, the treatment increased the application rate by 41 percentage points. Results were virtually identical across the two cohorts.[19]

These large differences in application rates translated into large differences in admissions rates. The (unconditional) admission rate was 15 percent in control schools and 32 percent in treated schools, a treatment effect of 17 percentage points. This is the net effect of the treatment on the joint likelihood of applying to and being admitted to the University of Michigan. Note that we do not condition on application when estimating the admissions effect. This is because application is (strongly!) affected by the treatment. As a result, treated students who (endogenously) apply are *not* comparable to those in the control schools who apply. Another way to put this is that treatment is not randomly assigned among *applicants*. This renders uninterpretable a treatment/control contrast in admission rates among those who apply.

Students in the treatment group were significantly more likely to enroll at University of Michigan than those in the control group. The (unconditional) enrollment rate for students at control schools is 12 percent while at treatment schools it is 27 percent. Treatment effects estimated by simple differences in means (shown in Appendix Figure 1), a regression controlling for strata (Model (1), shown in the first column of Table 3), and a regression controlling for strata and additional school covariates (Model (2), shown in the second column of Table 3) are virtually identical.[20]

7.2 Heterogeneous Treatment Effects: Region and Urbanicity

There were substantial differences in treatment effects across regions of the state and by urbanicity (see Table 4 for regression treatment effect estimates and Appendix Figures 2 and 3 for treatment and control means). Among control schools, application, admission, and enrollment rates were approximately twice as high in the Southeast (which includes Detroit and Ann Arbor, where the University of Michigan is located), compared to the West Central (a mix of rural and urban areas such as Grand Rapids) and the Upper Peninsula (a rural area).

HAIL equalized these outcomes across regions and urbanicity, with the largest treatment effects in the places with the lowest control means. For application, the treatment effect was largest in the West Central region (46 percentage points) and smallest in the Southeast (37 percentage points). Admission and enrollment effects were largest in the West Central and Upper Peninsula regions.

Reflecting the regional pattern, effects were largest in the rural areas, where control means are lowest. In the control group, the enrollment rate is 22 percent in the urban areas and 8 percent in

[19] We pool the two cohorts for most analyses; results separately by cohort are available upon request.
[20] Regression results including all controls are in Appendix Tables 3 through 8.

rural schools; the enrollment effects were 11 and 18 percentage points, respectively. As a result, the gap in enrollment rates between urban and rural schools was reduced from 14 percentage points in the control group to 7 percentage points in the treatment group (among treated schools, 32 percent enrolled in urban schools compared to 26 percent in rural schools). The outsized impact of the treatment on students in more rural areas of the state as well as locales farther from University of Michigan is consistent with the treatment compensating for student isolation, a potential mechanism we test in greater detail below.

7.3 Heterogeneous Treatment Effects: Student Characteristics

We find differences in treatment effects by student characteristics (see Table 5 and Appendix Figures 4 and 5).

In the control group, women were five percentage points *less* likely to apply than men (24 vs. 29 percent) but slightly *more* likely to enroll (12 vs. 11 percent), suggesting that, absent the treatment, female applicants are more qualified than male applicants. This is consistent with a large literature showing that men are more confident than women about their skills and qualifications. The HAIL treatment narrowed the gender gap in application (66 percent of women and 69 percent of men applied to University of Michigan from the treatment group) and widened the female advantage in enrollment. These results are consistent with HAIL compensating for women's lower levels of confidence about applying to a highly selective school.

We find substantial differences in treatment effects across race and ethnic groups. In the control group, low-income minority students were much more likely to attend University of Michigan than low-income white students. Nearly half of black students in the control group applied to University of Michigan (48 percent), and about a quarter enrolled (23 percent). In contrast, only 23 percent of white and Asian students in the control group applied, and just 10 percent enrolled. HAIL equalized these outcomes across racial groups: treatment effects on enrollment are largest for whites and Asians (15 percentage points) and smaller (and imprecise) for other minority students (7 percentage points) and black students (3 percentage points).[21] These racial differences in effects mirror the geographic distribution of race in Michigan. Black students are concentrated in the urban, Southeast region of the state, which has stronger connections to the University of Michigan. On the other hand, the rural areas in the West Central and Upper Peninsula are largely white.

We also compare treatment effects for students eligible for a free vs. reduced-price lunch.

[21] Black students in the treatment group have a slightly lower yield (enrollment conditional on admission) than both black students in the control group, and white and Asian students in general, suggesting that these students may face additional barriers in enrolling at UM. In the control group, however, black students have slightly higher yield rates compared to white students, which points to differences in the characteristics of black and white students affected by the treatment. Point estimates among black students, however, are quite noisy; we are reluctant to draw strong conclusions based on these findings.

Students who receive free lunch have lower incomes than those who receive subsidized lunch, as the income threshold for free lunch eligibility is 130 percent of the federal poverty line, compared to 185 percent of the federal poverty line for a reduced-price lunch (this difference corresponds to about $13,000 for a family of four in 2015). The majority of students in our sample received a free lunch (70 percent) compared to a reduced-price lunch (30 percent). Treatment effects were similar between the two groups.

Finally, we compare effects for students who did and did not send their ACT/SAT test scores to University of Michigan at the time of the test (Panel D of Table 5). Those in the control group who sent their scores were far more likely to apply and enroll: 42 (20) percent of students who sent their scores to University of Michigan subsequently applied (enrolled), compared to 16 (6) percent of students who did not send their scores. Proportionally, treatment effects were much larger among students who had not sent in their scores, resulting in a tripling of their application and enrollment rates. This suggests effects are larger for students who initially are not considering application to University of Michigan. We further explore this hypothesis in the next section.

7.4 Mechanisms: Isolation and Disconnection

Research by Hoxby and Avery (2012) suggests that isolated students are least likely to apply to selective institutions. We formally test how HAIL affected isolated students by estimating variation in the treatment effects by baseline, school-level application and enrollment rates to University of Michigan. We also estimate heterogeneity by the number of HAIL-eligible students in the school (see Table 6 and Figures 6 and 7).[22]

Heterogeneity is estimated by interacting the treatment indicator with linear terms for the baseline application/enrollment rates and the number of HAIL students in each school. For ease of interpretation, we present treatment effects in Table 6 calculated for the 25th percentile, median, and 75th percentile of the measure of isolation.[23]

Results are consistent with isolation being an important factor: treatment effects are largest in schools that previously had no students apply to or enroll at the University of Michigan. The effect on application is 46 percentage points for high schools at the 25th percentile of baseline application rates (this is a school where less than 2 percent of students applied). For high schools at the 75th percentile (where 7 percent applied) the effect is 41 percentage points.

We find similar patterns for admission and enrollment: treatment effects were largest in schools with the lowest baseline application rates, though effects were substantial across the distribution.

[22] Prior University of Michigan application and enrollment rates are for the graduating class of 2015. The number of HAIL-eligible students in each high school is cohort-specific.

[23] For estimated regression coefficients, see Appendix Table 9.

The effects are smallest at schools that had very high application rates at baseline. Results are quite similar when we use prior enrollment rates rather than prior application rates (Panel B, Table 6).

Finally, we examine heterogeneity based on the number of HAIL students in the school. The results (Panel C of Table 6, Figure 7) suggest isolation plays an important role in undermatch: treatment effects are largest at schools with the fewest HAIL-eligible students. For a school at the 25th percentile of this measure (two HAIL-eligible students), the effect on application is 44.5 percentage points. For a school at the 75th percentile (five HAIL-eligible students), the effect is 40 percentage points.

Together, these results suggest that the HAIL scholarship had the largest effect on students who were the sole recipient of the HAIL scholarship in their schools and among students who attended high schools with weak prior connections to the University of Michigan.

7.5 Effects on College Choice

Did HAIL increase the share of low-income students attending highly selective colleges, or did University of Michigan simply poach students from its competitors? To answer this question, we need national data on college attendance. Our data from the National Student Clearinghouse track college enrollment by the fall after a student's senior year.[24] For the first cohort of HAIL, we can track students across two years.

We find no diversion from colleges at least as selective as the University of Michigan (Table 7 and Appendix Figure 6). The offer of the HAIL scholarship increased enrollment at a highly (or most) selective college by 14.6 percentage points. This is identical to the effect on attendance at University of Michigan.[25] We find no evidence that HAIL induced students to attend (or not attend) other highly selective institutions (point estimate is 0.000). The standard error of this estimate rules out a decrease (or increase) of more than 1.4 percentage points in enrollment at other highly or most-selective colleges.[26]

The offer of HAIL increased the share of students enrolling at any four-year college (7.4 percentage points) and decreased the share enrolling at two-year colleges (3.5 percentage points). Surprisingly (at least to us), the likelihood of enrolling at any college increased by 3.9 percentage points. That is, roughly one quarter of the increase in enrollment at University of Michigan is driven by students who would not have attended *any* college in the absence of the treatment.

Together, these results show that nearly half of HAIL's effect on enrollment is diversion from

[24] A small number of students reports attending multiple colleges. We focus on the first institution.

[25] This estimate (which uses National Student Clearinghouse data) and the previously discussed estimate (based on University of Michigan data, Table 3) are nearly identical: 14.6 versus 14.9 percentage points. The minor difference is attributable to differences in the dates on which NSC and University of Michigan record enrollment.

[26] We are unable to observe whether students applied but did not gain admission to other highly selective institutions.

two-year colleges and non-attendance. The other half of the enrollment effect is drawn from four-year colleges that are less selective than University of Michigan.

These results are consistent with responses from focus groups held among students from the treatment group who enrolled in University of Michigan. Of the 15 students interviewed in the focus groups, 12 had no intention of applying to University of Michigan before the intervention. Typical among the target institutions mentioned by students were regional, four-year institutions such as Grand Valley State, Ferris State, Central Michigan University, Wayne State University, and Eastern Michigan University. One student in the focus group had contemplated a two-year college, while another explained that s/he "didn't count on going to college at all until I got the packet."

We also examine college choice by geographic region, urbanicity, race, and gender (Table 8). The largest effects, as found earlier, are in the West Central and Upper Peninsula regions and in rural areas. The offer of the HAIL scholarship increased the likelihood of enrolling at a four-year institution by 11 percentage points among students in the West Central region, nearly three times the effect among students in the Southeast (4 percentage points and insignificant). HAIL substantially narrowed urban/rural gaps in college choices.

HAIL had a stronger effect on the college choices of women than men, particularly on the likelihood of attending any college. Effects on attending any highly selective institution were largest among white and Asian students, while effects on four-year and any college attendance were larger among non-black, minority students. This suggests that, in the absence of the treatment, white and Asian treated students would have attended less selective four-year institutions, while treated students from other minority groups would not have gone to college at all or would have attended two-year institutions. We found no statistically significant effects on college choice for black students, though point estimates are noisy.

7.6 Persistence in College

Did those induced by HAIL into a highly selective college persist in college, or quickly drop out? Before undermatch was a hot topic, *overmatch* was a key concern, with some worried that disadvantaged students induced to attend highly selective schools would not be able to handle the academic competition. We have data on attendance in two consecutive years for the first cohort, which graduated high school in 2016 (Table 9). We find that the HAIL effects largely persist into the second year. Students offered the HAIL Scholarship are 13.5 percentage points more likely than controls to be enrolled in a highly (or most) selective college for two years. That is, the two-year effect on attending such a selective college is 88 percent (=13.5/15.3) of the one-year effect.

On all other measures, we find larger treatment effects over a two-year horizon than over one year. That is, the effect of HAIL increases with time, as students in the control group drop out

of their colleges at a higher rate than those in the treatment group. This is consistent with the hypothesis that students induced into more selective schools, with their better-prepared peers and more resources, are more likely to remain in school and graduate.

Students offered HAIL are 11 percentage points more likely to be enrolled in a four-year college for two years, a 20 percent increase (the one-year effect is 9.1 percentage points, a 14 percent increase). Further, students offered HAIL are eight percentage points more likely than controls to enroll in *any college* for two consecutive years. This is partly driven by HAIL getting students into college in the first place (four percentage points) and partly by inframarginal college students attending a more selective college with a higher retention rate.

We break out these effects by school and student characteristics in Table 10. The largest effects on persistence are in the West Central region and in the suburban and rural areas of the state. Persistence effects in the urban areas are, in fact, generally small and insignificant. Effects on persistence are largest for female students, with an 11 percentage point increase in the likelihood of attending two years of college (the effect is an insignificant 3 percentage points for males). Persistence effects by race/ethnicity are consistent with the initial enrollment results: we find larger effects among white and Asian students while effects for other racial minorities are noisy and often not significant. Control group means were also higher among these other minorities, which again points to the treatment having the largest impact on students who were otherwise less likely to attend a highly selective school.

7.7 Spillover Effects

The HAIL intervention may have affected the college choices of high school classmates who were ineligible for the HAIL scholarship. These peers were ineligible because of higher income and/or lower academic achievement. The sign of any spillover effect is theoretically ambiguous. Seeing a peer offered the HAIL scholarship may make University of Michigan seem more accessible to students (or adults around them), thereby increasing the likelihood of application. Or, seeing a peer offered the HAIL Scholarship may suggest to a student that she is not University of Michigan material, decreasing the likelihood of application. Finally, the University of Michigan may have informal quotas for each school, which would mechanically constrain admissions for classmates (they deny this).

To check for spillover effects, we replicate our analysis among students who are ineligible for HAIL, with the treatment dummy indicating that their school is in the HAIL treatment group (Table 11). We find the application rate is 1.1 percentage points lower for non-HAIL students at treatment schools than at control schools. But, after we control for baseline application rates, this negative spillover effect disappears (recall tha the treatment and control schools were slightly imbalanced on

this baseline attribute). Note that our main results did not change when we added these controls. We conclude there is no evidence that the HAIL scholarship had any negative (or positive) spillover effects on non-HAIL peers.

7.8 Randomization-Based Inference

The effects discussed so far are extremely large and are unlikely to have occurred by chance. We demonstrate this with a simulation exercise following Athey and Imbens (2017), who recommend randomization-based statistical inference for significance tests. This approach calculates the likelihood of obtaining the observed treatment effects by random chance, where the randomness comes from assignment of a fixed number of units (in our case, high schools) to treatment, rather than from random sampling from a population.

Using the first and second cohorts of 1,026 schools, we re-assign treatment status using the same procedure used in the original randomization. We then estimate "treatment effects" based on this reassignment. We repeat this procedure 10,000 times to generate a distribution of potential treatment effects that could be due to baseline differences between schools assigned to treatment and control. For each outcome, we calculate the share of the 10,000 simulated treatment-control differences that is larger in absolute value than the difference observed in the actual random assignment discussed throughout the paper. This proportion represents the randomization-based p-value.

The results are summarized in Figure 8, where we plot the distribution of treatment effects from the 10,000 iterations for a selection of outcomes. The dashed vertical line in each graph plots the actual treatment effect. Results are also presented in Table 12.

Our findings cannot be explained by random differences between the treatment and control schools. As we would expect under successful randomization, for each outcome the average simulated treatment effect is zero, indicating no difference between the randomly-assigned treated and control schools in average outcomes over 10,000 iterations.

For our key outcome, enrollment at University of Michigan, we never observe a simulated treatment effect as large as the actual treatment effect in any of the 10,000 iterations. In other words, the randomization-based p-value is precisely zero. For the other outcomes, the randomization-based p-values are comparable to the sampling-based p-values shown earlier in the paper. For example, we showed earlier that the offer of HAIL increased college enrollment by 3.9 percentage points, with a sampling-based p-value of 0.031. In the simulations, we observe a treatment effect this large 385 times out of 10,000, or 3.9 percent of the time (a randomization-based p-value of 0.039).

For enrollment at any highly selective institution and enrollment at a four-year institution, there is less than a four percent chance of observing an effect at least as large as the actual treatment

effect in the 10,000 simulations. Although they represent different conceptual approaches, the sampling-based and randomization-based analyses produce virtually identical conclusions about the effects of the HAIL intervention.

8 Conclusion

We close the paper with the statistics that motivated it: gaps in college choice between low-income students and their higher-income peers in Michigan (Figure 9). HAIL closed by half the income gap in college attendance among high-achieving students: the college attendance rate is 88 percent among upper-income students, 85 percent among low-income students in the treatment group, and 81 percent among low-income students in the control group.

HAIL also narrowed, eliminated, and even reversed income gaps in college selectivity. The gap in attending an institution considered "selective" or above was reduced from 12 percentage points to 4 percentage points, and the income gap in attending an institution considered "very selective" or above was eliminated. Low-income, high-achieving students offered HAIL are *more likely* to attend a university at least as selective as the University of Michigan as their upper-income peers: 26 vs. 20 percent, respectively.

Results from the first two years of the HAIL scholarship intervention reveal the potential of a personalized, targeted outreach campaign for altering the schooling decisions of low-income, high-achieving students. Students offered HAIL were more than twice as likely to apply and enroll at University of Michigan compared to control students. The large enrollment effect is driven by shifting students away from two-year and less selective four-year colleges, as well as inducing students to attend any college at all. We find no evidence that HAIL diverted students from other highly selective institutions. Students offered the HAIL Scholarship persisted in college at substantially higher rates than students in the control group.

The HAIL scholarship had an equalizing effect, increasing application and enrollment rates among those least likely to apply to a highly selective college. Though the magnitude of the effect varies across student and school types, the treatment had a strong, positive effect across most subgroups we studied. Treatment effects were particularly large among students at schools that historically had no students apply to or enroll at the University of Michigan in Ann Arbor.

In current work, we track the effects of the intervention on college major, persistence, and graduation. In the longer term, we plan to examine effects on earnings and other measures of adult well-being.

Our results show that a low-cost, low-touch intervention can strongly affect student application and enrollment at selective colleges. This contrasts with the conclusion of Carrell and Sacerdote

(2017) that only high-touch, "boots on the ground" interventions can have large effects on students' decisions to apply to and attend college.

Can HAIL be replicated in other places and with other populations? We suspect that the answer is yes, but caution that it could produce unintended consequences if not carefully planned and targeted.

In several ways, Michigan is the perfect setting for a HAIL-like intervention. The University of Michigan is the most selective, highest quality, *and* least expensive option for low-income students in Michigan. The school fully meets need (as defined by the financial aid formulas). Its spending per pupil and graduation rates are higher than any other college in the state. Its closest competitor is Michigan State University, which does not fully meet students' financial need and has a lower graduation rate. It is unlikely that inducing students to attend University of Michigan could make them worse off, financially or academically, in the short or long run.[27]

In other settings, by contrast, the flagship public college may be a *worse* choice than other schools in the state. A college that does not fully meet need could use a tuition guarantee to attract students from peer schools that do meet need, thereby making targeted students worse off financially. In Massachusetts, for example, high-achieving students are often better off at private colleges, which have higher graduation rates and provide more aid. A merit scholarship in Massachusetts diverted students from private to public colleges, and thereby *reduced* their likelihood of graduating from college (Cohodes and Goodman 2014).

Schools and states considering a HAIL-like intervention should therefore carefully examine students' choice sets before launching a similar program. In a setting with multiple highly-selective schools, for example, schools could jointly make an aid guarantee. This would equalize the cost of the options, allowing the student to choose the school that best fits her academic needs.

In short, the evidence indicates that the decisions of low-income, high-achieving students can be strongly influenced by an inexpensive outreach campaign. This is both good news and bad news. When well-targeted, a HAIL-like intervention could substantially improve postsecondary outcomes for low-income students. When poorly planned, or wielded by bad actors, it could do serious harm.

[27] We were concerned that HAIL could have diverted students from the most competitive colleges like Harvard and Stanford, with their elite networks, but it did not.

Tables

Table 1
Characteristics of Selected Universities in Michigan

	University of Michigan	Michigan State University	Eastern Michigan University	Washtenaw Community College
Barron's selectivity category	Highly competitive	Very competitive	Competitive	Not rated
Average annual cost for in-state students				
All students	$14,521	$16,788	$12,675	$6,148
Students with family income $30-48K	$6,561	$11,872	$10,791	$3,954
Graduation rate	0.90	0.78	0.38	0.16
Median salary after attending	$60,100	$51,500	$37,500	$27,200

Source: College Scorecard, https://collegescorecard.ed.gov, accessed May 31, 2018.
Notes: University of Michigan refers to the Ann Arbor campus. Average annual cost represents "the average annual net price for federal financial aid recipients, after aid from the school, state, or federal government." The graduation rate for the four-year schools is the proportion of first-time, full-time students who complete a bachelor's degree within six years; for Washetenaw Community College it is the proportion of first-time, full-time students who complete a two-year degree within three years. Median salary represents "the median earnings of former students who received federal financial aid, at 10 years after entering the school." All quotes are from College Scorecard.

Table 2
Balance Table: School Characteristics (First and Second HAIL Cohorts)

Characteristic	Mean		P-value
	Control schools	Treated schools	
Region, urbanicity, and distance			
Upper Peninsula	0.150	0.130	0.344
	(0.016)	(0.015)	
West Central	0.449	0.476	0.359
	(0.022)	(0.022)	
Southeast	0.401	0.394	0.788
	(0.021)	(0.022)	
Suburban	0.340	0.360	0.537
	(0.021)	(0.021)	
City	0.129	0.100	0.148
	(0.015)	(0.013)	
Rural	0.530	0.540	0.718
	(0.022)	(0.022)	
Distance from UM	93.2	96.4	0.529
	(3.545)	(3.673)	
Student demographic characteristics			
Proportion female	0.571	0.605	0.112
	(0.015)	(0.015)	
Proportion white or Asian	0.834	0.844	0.576
	(0.013)	(0.012)	
Proportion black	0.094	0.087	0.618
	(0.011)	(0.010)	
Proportion other race/ethnicity	0.072	0.069	0.803
	(0.009)	(0.008)	
Proportion free lunch eligible	0.709	0.692	0.459
	(0.014)	(0.015)	
Proportion reduced-price lunch eligible	0.291	0.308	0.459
	(0.014)	(0.015)	
Student academic characteristics			
Average SAT (or equivalent)	1254	1260	0.194
	(2.690)	(2.896)	
Average GPA	3.823	3.833	0.208
	(0.006)	(0.006)	
Proportion limited English proficient	0.002	0.004	0.410
	(0.001)	(0.001)	
Proportion receiving special education services	0.009	0.013	0.367
	(0.003)	(0.004)	
Proportion who sent ACT/SAT scores to UM	0.365	0.377	0.695
	(0.015)	(0.016)	
UM application rate in 2015	0.067	0.055	0.016
	(0.004)	(0.004)	
Missing 2015 UM application rate	0.004	0.020	0.015
	(0.003)	(0.006)	

Table 2 *(Continued)*
Balance Table: School Characteristics (First and Second HAIL Cohorts)

Characteristic	Mean		P-value
	Control schools	Treated schools	
School size			
# of 11th grade students in school	189.1	175.1	0.055
	(0.003)	(0.006)	
# of HAIL students in school	3.8	3.9	0.649
	(0.140)	(0.163)	
F-test for joint significance: p-value			0.0004
Number of schools	526	500	1,026
Number of students	1,978	1,932	3,910

Source: Michigan administrative data and University of Michigan Office of Enrollment Management data.
Notes: All analyses done at the school-year level. P-values are from a t-test of the coefficient on treatment status from a regression of the characteristic on treatment and strata dummies. F-test p-value is from a regression of treatment status on all characteristics and strata dummies; F-test tests all the school characteristics (not including strata) jointly. Robust standard errors reported. "Other race/ethnicity" includes Hispanic, American Indian or Alaska Native, and Native Hawaiian or other Pacific Islander students.

Table 3
Estimated Effect of HAIL Scholarship on Application, Admission, and Enrollment to UM (First and Second HAIL Cohorts)

Outcome	Treatment effect		Control mean
Applied	0.416	0.413	0.259
	(0.021)	(0.019)	
Admitted	0.174	0.163	0.149
	(0.019)	(0.017)	
Enrolled	0.149	0.141	0.117
	(0.018)	(0.016)	
Strata dummies	X	X	
Covariates		X	
Number of schools	1,026		
Number of students	3,910		

Source: Michigan administrative data and University of Michigan Office of Enrollment Management data.
Notes: All analyses done at the school-year level. Covariates include all characteristics listed in Table 2. Robust standard errors reported. Application, admission and enrollment measured in the summer and fall following expected high school graduation. Admission and enrollment are unconditional on application.

Table 4
Estimated Effect of HAIL Scholarship on Application, Admission, and Enrollment to UM by High School Geography (First and Second HAIL Cohorts)

Panel A. Region			
	Southeast	*West Central*	*Upper Peninsula*
Applied	0.369	0.462	0.398
	(0.031)	(0.029)	(0.059)
	[0.363]	[0.2]	[0.156]
Admitted	0.156	0.185	0.187
	(0.031)	(0.026)	(0.054)
	[0.202]	[0.116]	[0.335]
Enrolled	0.142	0.151	0.176
	(0.029)	(0.024)	(0.051)
	[0.167]	[0.085]	[0.08]
Number of schools	408	474	144
Number of students	1,848	1,646	416
Panel B. Urbanicity			
	Suburb	*City*	*Town or Rural*
Applied	0.381	0.296	0.483
	(0.031)	(0.063)	(0.028)
	[0.335]	[0.464]	[0.363]
Admitted	0.156	0.057	0.225
	(0.029)	(0.067)	(0.026)
	[0.164]	[0.319]	[0.097]
Enrolled	0.133	0.114	0.181
	(0.027)	(0.061)	(0.024)
	[0.14]	[0.221]	[0.078]
Number of schools	359	118	549
Number of students	1,784	530	1,596

Source: Michigan administrative data and University of Michigan Office of Enrollment Management data.
Notes: All analyses done at the school-year level. Coefficients are from separate regressions of outcome on treatment status and strata dummies, estimated on the subgroup. Robust standard errors reported in parentheses.Control mean for subgroup in brackets. Application, admission and enrollment measured in the summer and fall following expected high school graduation. Admission and enrollment are unconditional on application.

Table 5
Estimated Effect of HAIL Scholarship on Application, Admission, and Enrollment to UM by Selected Student Characteristics (First and Second HAIL Cohorts)

Panel A. Gender		
	Male	*Female*
Applied	0.398	0.418
	(0.028)	(0.025)
	[0.286]	[0.239]
Admitted	0.138	0.188
	(0.024)	(0.022)
	[0.139]	[0.143]
Enrolled	0.114	0.163
	(0.022)	(0.021)
	[0.105]	[0.115]
Number of schools	729	855
Number of students	1,637	2,273

Panel B. Race/Ethnicity			
	White or Asian	*Black*	*Other*
Applied	0.434	0.250	0.242
	(0.022)	(0.060)	(0.068)
	[0.234]	[0.478]	[0.393]
Admitted	0.181	0.070	0.043
	(0.019)	(0.059)	(0.062)
	[0.129]	[0.283]	[0.258]
Enrolled	0.153	0.034	0.072
	(0.018)	(0.055)	(0.058)
	[0.103]	[0.234]	[0.199]
Number of schools	948	206	191
Number of students	3,312	330	268

Table 5 *(Continued)*
Estimated Effect of HAIL Scholarship on Application, Admission, and Enrollment to UM by Selected Student Characteristics (First and Second HAIL Cohorts)

Panel C. Free or Reduced-Price Lunch Eligibility		
	Free Lunch	*Reduced-Price*
Applied	0.416	0.406
	(0.023)	(0.032)
	[0.27]	[0.245]
Admitted	0.169	0.138
	(0.021)	(0.028)
	[0.151]	[0.146]
Enrolled	0.145	0.108
	(0.020)	(0.026)
	[0.116]	[0.118]
Number of schools	923	607
Number of students	2,748	1,162
Panel D. Pre-Treatment Interest in UM		
	Sent SAT Scores to UM	*Did Not Send Scores to UM*
Applied	0.370	0.431
	(0.029)	(0.023)
	[0.421]	[0.161]
Admitted	0.168	0.163
	(0.030)	(0.019)
	[0.255]	[0.081]
Enrolled	0.156	0.138
	(0.028)	(0.018)
	[0.199]	[0.059]
Number of schools	663	882
Number of students	1,514	2,396

Source: Michigan administrative data and University of Michigan Office of Enrollment Management data.
Notes: All analyses done at the school-year level. Coefficients are from separate regressions of school-subgroup-level outcome rate on treatment status and strata dummies. Robust standard errors reported in parentheses. Control mean for subgroup in brackets. UM application, admission and enrollment measured in the summer and fall following expected high school graduation. Admission and enrollment are unconditional on application.

Table 6
Estimated Effect of HAIL Scholarship on Application, Admission, and Enrollment to UM by Historical School Connection to UM and Number of HAIL Students (First and Second HAIL Cohorts)

	Percentile of interacted variable			P-value on interaction term
	25th	Median	75th	
Panel A. Prior School-Level UM Application Rate				
Estimated treatment effect				
Applied	0.464	0.445	0.414	0.000
Admitted	0.195	0.188	0.177	0.161
Enrolled	0.164	0.16	0.153	0.365
Prior application rate at percentile	0.019	0.038	0.071	
Panel B. Prior School-Level UM Enrollment Rate				
Estimated treatment effect				
Applied	0.48	0.445	0.407	0.000
Admitted	0.198	0.187	0.176	0.14
Enrolled	0.169	0.16	0.151	0.249
Prior enrollment rate at percentile	0	0.013	0.027	
Panel C. Number of HAIL Students in School				
Estimated treatment effect				
Applied	0.445	0.429	0.396	0.001
Admitted	0.19	0.181	0.163	0.036
Enrolled	0.165	0.156	0.139	0.032
# of HAIL students at percentile	2	3	5	

Source: Michigan administrative data and University of Michigan Office of Enrollment Management data.
Notes: All analyses done at the school-year level. Results are from a regression of the outcome on treatment, the named variable, the interaction of the two, and strata dummies. Robust standard errors estimated. Estimated treatment effects at percentiles calculated by adding the estimated coefficient on treatment to the product of the estimated interaction term and the value of the interacted variable at the percentile. Prior UM application rate and enrollment rates are for the graduating class of 2015.

Table 7
Estimated Effect of HAIL Scholarship on College Choice (First and Second HAIL Cohorts)

College attended	Treatment effect	Control mean
Highly competitive or above	0.146	0.135
	(0.018)	
UM	0.146	0.107
	(0.016)	
Highly competitive or above other than UM	0.000	0.028
	(0.007)	
Four-year	0.074	0.675
	(0.020)	
Two-year	-0.035	0.116
	(0.013)	
Any	0.039	0.791
	(0.018)	
In Michigan	0.045	0.727
	(0.020)	
Public in Michigan	0.062	0.645
	(0.021)	
Outside Michigan	-0.006	0.064
	(0.010)	
Number of schools	1,026	
Number of students	3,910	

Source: Michigan administrative data and National Student Clearinghouse data.
Notes: All analyses done at the school-year level. Coefficients are from regressions of outcome on treatment status and strata dummies. Robust standard errors reported. Enrollment is measured at the first college attended in the fall following expected high school graduation and is unconditional on any college enrollment.

Table 8
Estimated Effect of HAIL Scholarship on College Choice by Selected School and Student Characteristics (First and Second HAIL Cohorts)

Panel A. Region			
	Southeast	*West Central*	*Upper Peninsula*
Highly competitive or above	0.129	0.163	0.160
	(0.030)	(0.024)	(0.052)
	[0.199]	[0.092]	[0.091]
UM	0.133	0.133	0.167
	(0.029)	(0.022)	(0.052)
	[0.162]	[0.068]	[0.078]
Four-year	0.041	0.114	0.037
	(0.029)	(0.031)	(0.060)
	[0.774]	[0.579]	[0.697]
Any	0.024	0.045	0.061
	(0.026)	(0.027)	(0.055)
	[0.84]	[0.758]	[0.757]
Number of schools	408	474	144
Number of students	1,848	1,646	416
Panel B. Urbanicity			
	Suburb	*City*	*Town or Rural*
Highly competitive or above	0.136	0.079	0.181
	(0.029)	(0.063)	(0.024)
	[0.163]	[0.249]	[0.088]
UM	0.126	0.078	0.187
	(0.027)	(0.058)	(0.023)
	[0.139]	[0.203]	[0.063]
Four-year	0.039	0.007	0.103
	(0.030)	(0.064)	(0.030)
	[0.746]	[0.704]	[0.622]
Any	0.014	0.018	0.053
	(0.027)	(0.056)	(0.026)
	[0.838]	[0.783]	[0.762]
Number of schools	359	118	549
Number of students	1,784	530	1,596

Table 8 *(Continued)*
Estimated Effect of HAIL Scholarship on College Choice by Selected School and Student Characteristics (First and Second HAIL Cohorts)

Panel C. Gender		
	Male	*Female*
Highly competitive or above	0.110	0.167
	(0.023)	(0.021)
	[0.135]	[0.125]
UM	0.112	0.161
	(0.022)	(0.020)
	[0.1]	[0.104]
Four-year	0.073	0.086
	(0.027)	(0.025)
	[0.672]	[0.671]
Any	0.029	0.055
	(0.023)	(0.021)
	[0.798]	[0.793]
Number of schools	729	855
Number of students	1,637	2,273

Panel D. Race/Ethnicity			
	White or Asian	*Black*	*Other*
Highly competitive or above	0.151	0.061	0.082
	(0.018)	(0.057)	(0.057)
	[0.119]	[0.272]	[0.179]
UM	0.150	0.018	0.079
	(0.017)	(0.052)	(0.056)
	[0.096]	[0.214]	[0.167]
Four-year	0.072	-0.041	0.167
	(0.022)	(0.055)	(0.064)
	[0.675]	[0.792]	[0.593]
Any	0.031	-0.062	0.121
	(0.018)	(0.049)	(0.055)
	[0.801]	[0.848]	[0.716]
Number of schools	948	206	191
Number of students	3,312	330	268

Source: Michigan administrative data and National Student Clearinghouse data.
Notes: All analyses done at the school-year level. For Panels A and B, coefficients are from separate regressions of outcome on treatment status and strata dummies, estimated on the subgroup. For Panels C and D, coefficients are from separate regressions of school-subgroup-level outcome rate on treatment status and strata dummies. Robust standard errors reported in parentheses. Control mean for subgroup in brackets. Enrollment is measured at the first college attended in the fall following expected high school graduation and is unconditional on any college enrollment.

Table 9
Estimated Effect of HAIL Scholarship on College Enrollment and Persistence (First HAIL Cohort)

	Attended fall following high school graduation		Attended two consecutive falls following high school graduation	
College attended	Treatment effect	Control mean	Treatment effect	Control mean
Highly competitive or above	0.153	0.129	0.135	0.126
	(0.024)		(0.023)	
UM	0.147	0.104	0.128	0.102
	(0.022)		(0.022)	
Four-year	0.091	0.651	0.109	0.557
	(0.028)		(0.029)	
Any	0.057	0.779	0.079	0.683
	(0.025)		(0.027)	
Number of schools	529			
Number of students	2,108			

Source: Michigan administrative data and National Student Clearinghouse data.
Notes: All analyses done at the school-year level. Coefficients are from regressions of outcome on treatment status and strata dummies. Robust standard errors reported. Enrollment is measured at the first college attended in the two falls following expected high school graduation and is unconditional on any college enrollment.

Table 10
Estimated Effect of HAIL Scholarship on Second Year College Persistence by Selected School and Student Characteristics (First HAIL Cohort)

Panel A. Region			
	Southeast	*West Central*	*Upper Peninsula*
Highly competitive or above	0.127	0.148	0.132
	(0.039)	(0.029)	(0.067)
	[0.183]	[0.089]	[0.091]
UM	0.113	0.144	0.125
	(0.037)	(0.028)	(0.066)
	[0.145]	[0.07]	[0.091]
Four-year	0.091	0.146	0.046
	(0.042)	(0.043)	(0.083)
	[0.667]	[0.462]	[0.563]
Any	0.084	0.085	0.053
	(0.038)	(0.041)	(0.080)
	[0.746]	[0.632]	[0.676]
Number of schools	204	247	78
Number of students	951	927	230
Panel B. Urbanicity			
	Suburb	*City*	*Town or Rural*
Highly competitive or above	0.160	0.016	0.150
	(0.035)	(0.085)	(0.031)
	[0.115]	[0.267]	[0.1]
UM	0.129	-0.006	0.161
	(0.033)	(0.079)	(0.030)
	[0.096]	[0.234]	[0.076]
Four-year	0.112	0.057	0.118
	(0.044)	(0.085)	(0.042)
	[0.623]	[0.646]	[0.498]
Any	0.109	0.050	0.067
	(0.041)	(0.072)	(0.040)
	[0.722]	[0.739]	[0.648]
Number of schools	179	60	290
Number of students	930	284	894

Table 10 *(Continued)*
Estimated Effect of HAIL Scholarship on Second Year College Persistence by Selected School and Student Characteristics (First HAIL Cohort)

Panel C. Gender		
	Male	*Female*
Highly competitive or above	0.120	0.150
	(0.030)	(0.028)
	[0.118]	[0.115]
UM	0.119	0.136
	(0.029)	(0.026)
	[0.091]	[0.098]
Four-year	0.116	0.112
	(0.039)	(0.036)
	[0.561]	[0.56]
Any	0.030	0.105
	(0.036)	(0.032)
	[0.71]	[0.682]
Number of schools	384	441
Number of students	883	1,225

Panel D. Race/Ethnicity			
	White or Asian	*Black*	*Other*
Highly competitive or above	0.145	0.100	0.051
	(0.024)	(0.076)	(0.072)
	[0.11]	[0.221]	[0.183]
UM	0.142	0.016	0.051
	(0.023)	(0.067)	(0.071)
	[0.09]	[0.177]	[0.175]
Four-year	0.105	-0.018	0.089
	(0.031)	(0.089)	(0.090)
	[0.552]	[0.695]	[0.497]
Any	0.072	-0.014	0.047
	(0.029)	(0.080)	(0.086)
	[0.687]	[0.757]	[0.615]
Number of schools	496	100	114
Number of students	1,786	165	157

Source: Michigan administrative data and National Student Clearinghouse data.
Notes: All analyses done at the school-year level. For Panels A and B, coefficients are from separate regressions of outcome on treatment status and strata dummies, estimated on the subgroup. For Panels C and D, coefficients are from separate regressions of school-subgroup-level outcome rate on treatment status and strata dummies. Robust standard errors reported in parentheses. Control mean for subgroup in brackets. Enrollment is measured at the first college attended in the two falls following expected high school graduation and is unconditional on any college enrollment.

Table 11
Estimated Spillover Effect of HAIL Scholarship on Application, Admission, and Enrollment to UM for Non-HAIL Students, Controlling for Historical Rates (First and Second HAIL cohorts)

	(1)	(2)	(3)
Panel A. Application			
Treatment Effect on non-HAIL students	-0.011	-0.000	0.001
	(0.005)	(0.002)	(0.002)
R-squared	0.030	0.852	0.870
Strata dummies	X	X	X
2015 application rate		X	X
2009-2014 application rates			X
Panel B. Admission			
Treatment Effect on non-HAIL students	-0.005	-0.000	0.000
	(0.003)	(0.001)	(0.001)
R-squared	0.024	0.782	0.828
Strata dummies	X	X	X
2015 admission rate		X	X
2009-2014 admission rates			X
Panel C. Enrollment			
Treatment Effect on non-HAIL students	-0.004	-0.000	0.000
	(0.002)	(0.001)	(0.001)
R-squared	0.022	0.725	0.770
Strata dummies	X	X	X
2015 enrollment rate		X	X
2009-2014 enrollment rates			X
Number of schools		1,025	

Source: Michigan administrative data and University of Michigan Office of Enrollment Management data.
Notes: All analyses done at the school-year level. Coefficients are from regression of outcome rate for non-HAIL eligible students on treatment status and strata dummies, plus controls as indicated. Schools missing historical rates are assigned values of zero, and regressions include missingness indicators. Robust standard errors reported in parentheses.

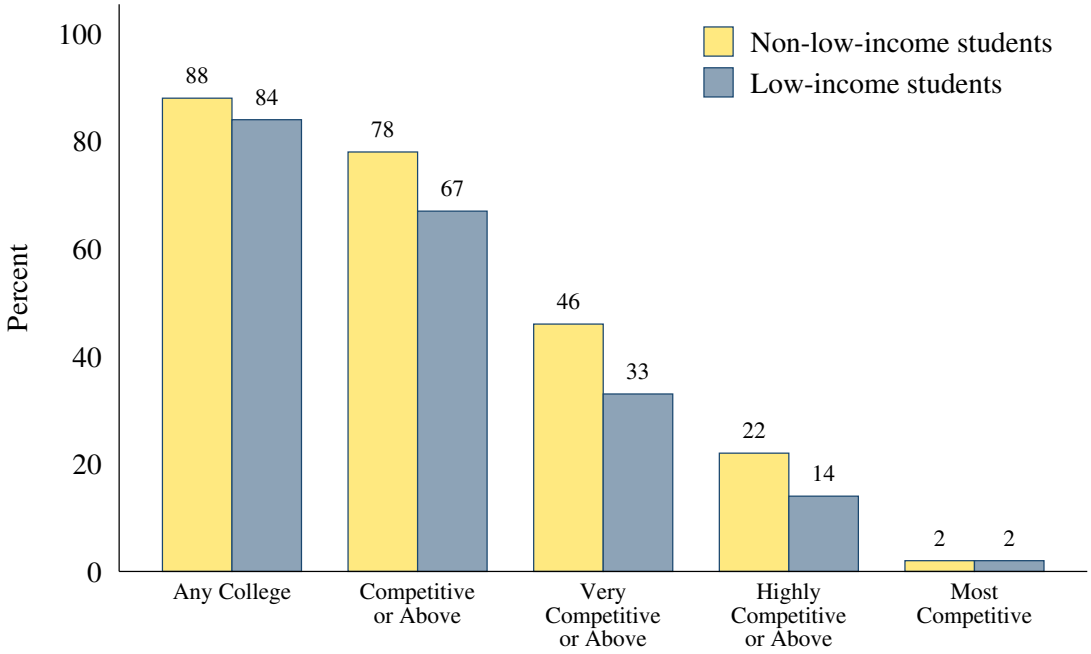
Table 12
Randomization-Based Inference on College Choice Outcomes (First and Second HAIL Cohorts)

College Attended	Estimated treatment effect	Simulated treatment effects (10,000 iterations)					Randomiz.-based p-value	Sampling-based p-value
		Mean	Std. Dev.	Min	Max	# greater than estim. effect		
Highly competitive or above	0.146	0.000	0.020	-0.077	0.075	0	0.000	0.000
UM	0.146	0.000	0.019	-0.064	0.083	0	0.000	0.000
Highly competitive or above other than UM	0.000	0.000	0.007	-0.023	0.024	9,809	0.981	0.981
Four-year	0.074	0.000	0.022	-0.082	0.081	11	0.001	0.000
Two-year	-0.035	0.000	0.014	-0.051	0.053	112	0.011	0.007
Any	0.039	0.000	0.019	-0.079	0.064	385	0.039	0.031
In Michigan	0.045	0.000	0.020	-0.084	0.084	265	0.027	0.021
Public in Michigan	0.062	0.000	0.021	-0.085	0.086	30	0.003	0.003
Outside Michigan	-0.006	0.000	0.010	-0.036	0.036	5,432	0.543	0.531

Source: Michigan administrative data and National Student Clearinghouse data.
Notes: Each simulated treatment effect comes from first randomly assigning schools to treatment using the same randomization algorithm used for true assignment, then running a regression of the outcome on "treatment" status, including controls for strata. Exact p-value is calculated as the number of simulated effects greater in absolute value than the estimated effect.

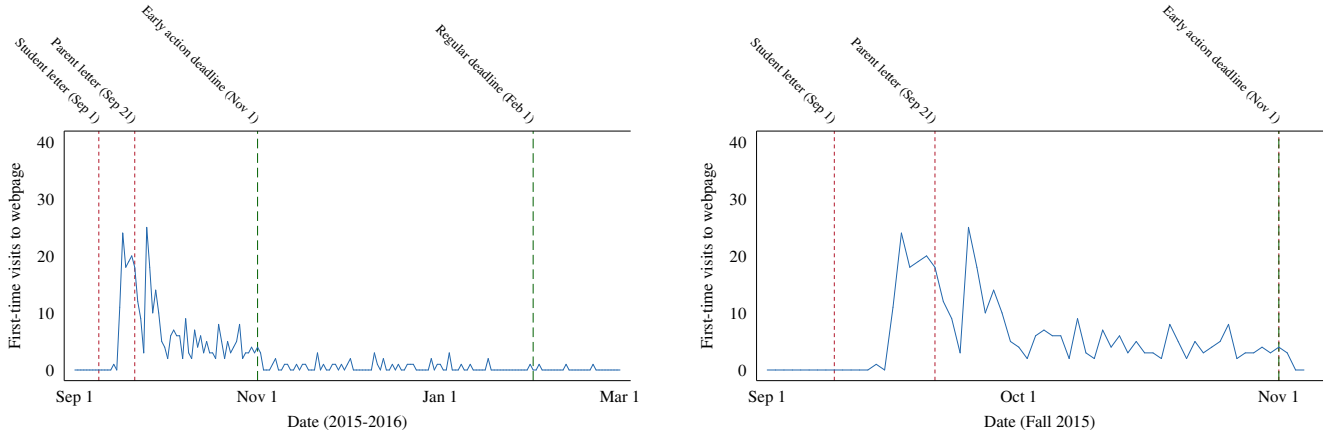
Figures

Figure 1
Selectivity of Colleges Attended by High-Achieving Michigan Students, by Income

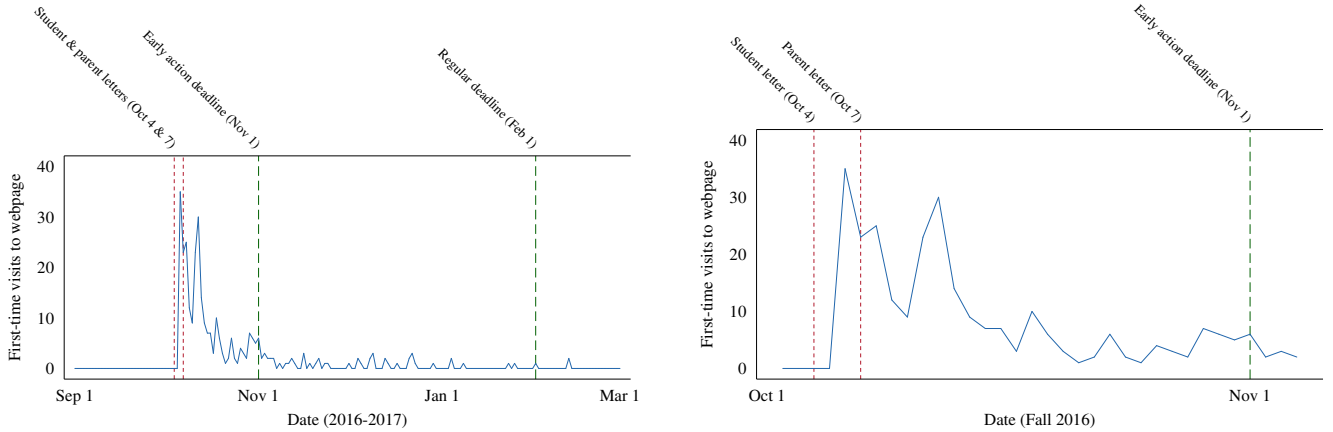


Source: Michigan administrative data and National Student Clearinghouse data.
Notes: Sample is 11th grade students in Michigan public schools in 2013 who meet HAIL GPA and ACT criteria. College enrollment measured at first institution attended in fall 2014. Low-income means eligible for free or reduced-price lunch in 11th grade. Selectivity categories from Barron's selectivity index.

Figure 2
First-Time Visits to HAIL Webpages



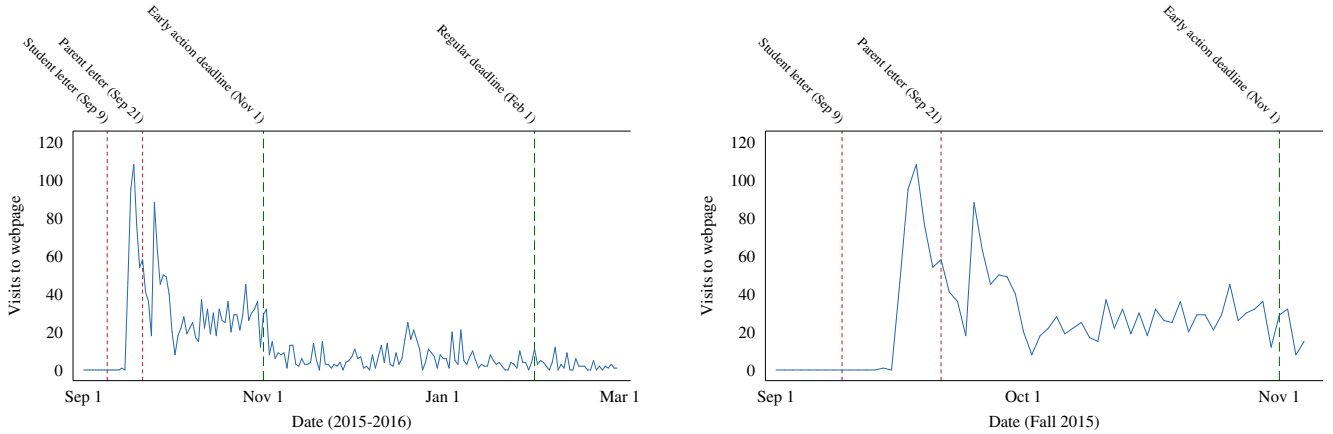
(a) First HAIL Cohort



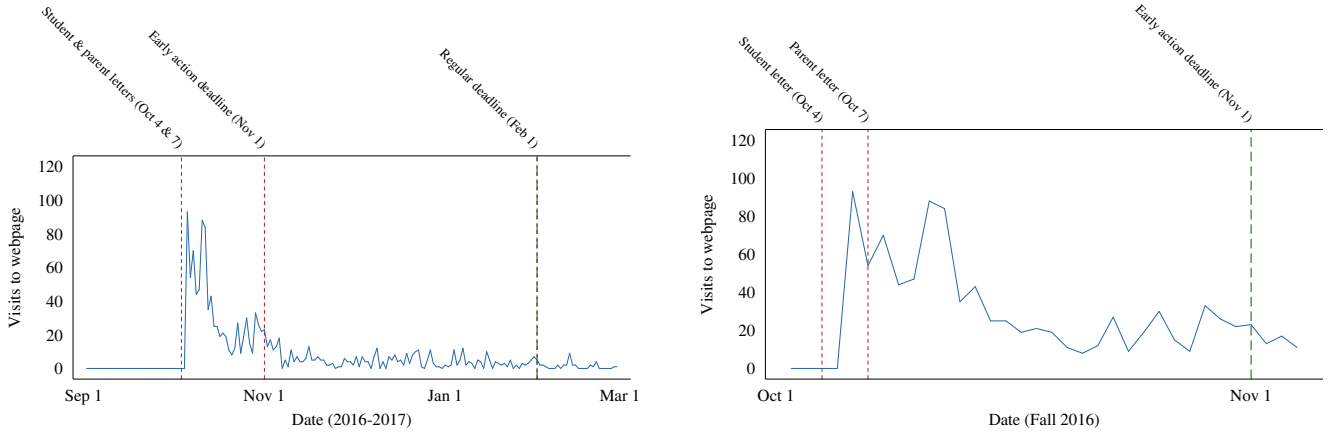
(b) Second HAIL Cohort

Source: University of Michigan Office of Enrollment Management data.
Notes: Unit of analysis is a first-time visit to the personalized URL associated with a treated HAIL student, aggregated by date.

Figure 3
Visits to HAIL Webpages



(a) First HAIL Cohort



(b) Second HAIL Cohort

Source: University of Michigan Office of Enrollment Management data.
Notes: Unit of analysis is a visit to a personalized URL associated with a treated HAIL student, aggregated by date.

Figure 4
HAIL Students Are Widely Dispersed Across Michigan (First and Second HAIL Cohorts)

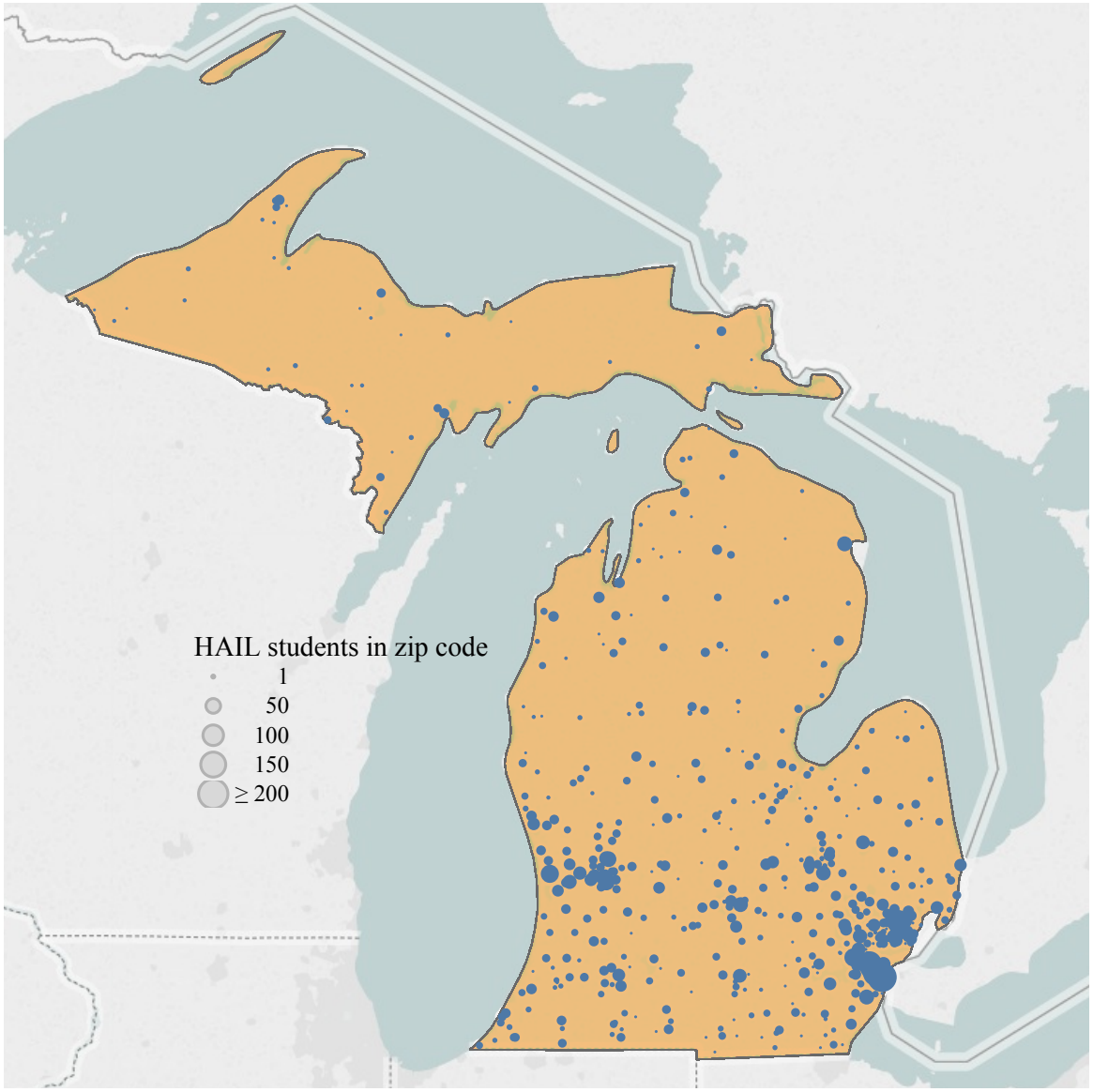
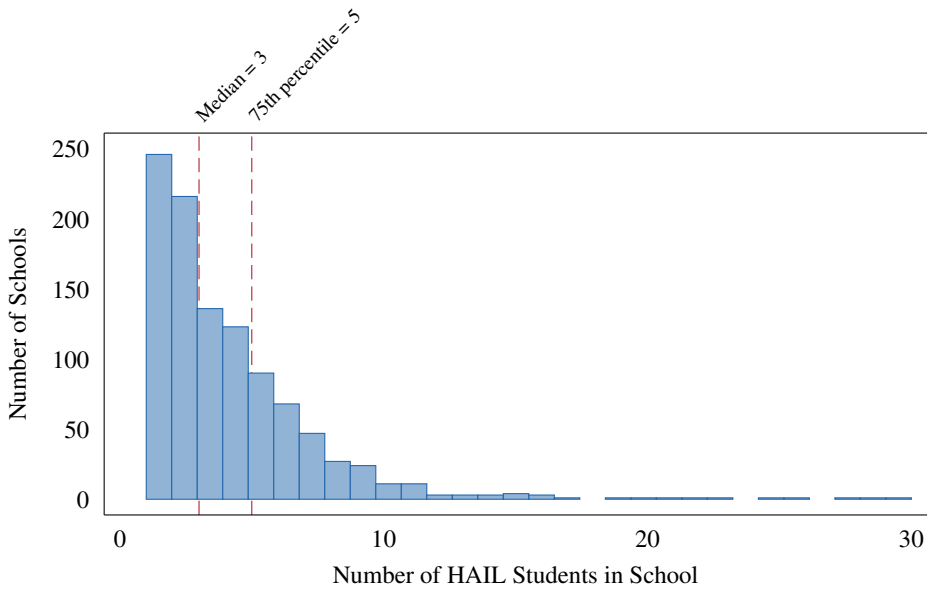


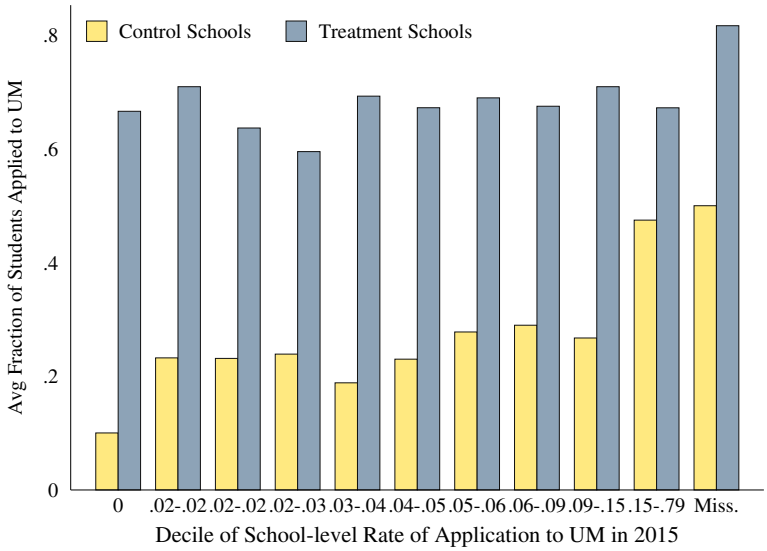
Figure 5
Typical School Has Few HAIL Students (First and Second HAIL Cohorts)



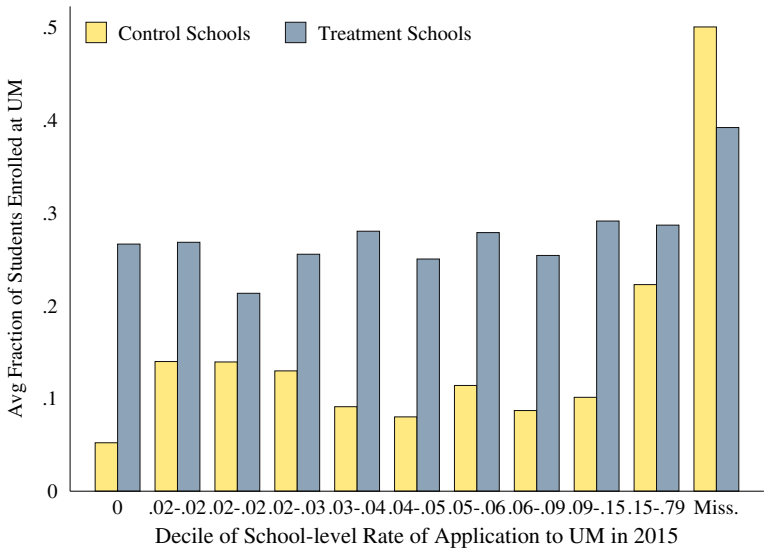
Source: Michigan administrative data.
Notes: Unit of analysis is the school-year.

Figure 6
Estimated Effect of HAIL Scholarship on Application and Enrollment to UM by Prior School-Level Application Rate to UM (First and Second HAIL Cohorts)

(a) Applied



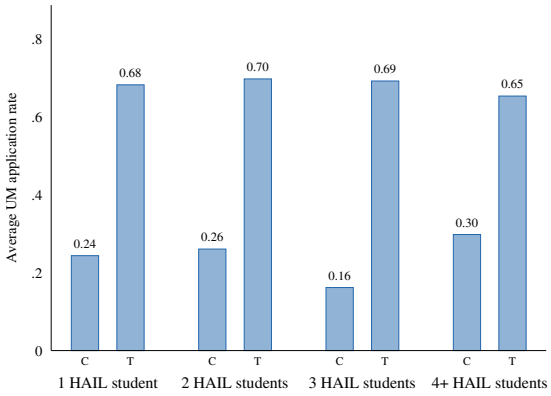
(b) Enrolled



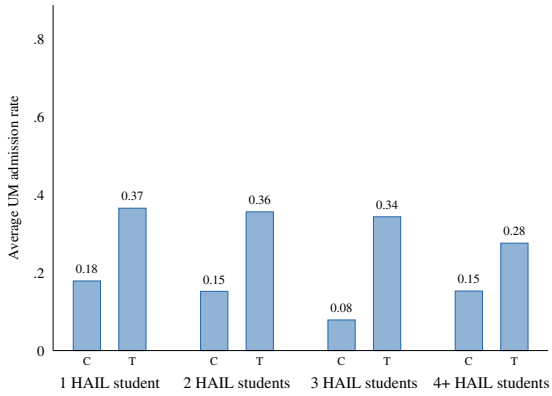
Source: Michigan administrative data and University of Michigan Office of Enrollment Management data.
Notes: All analyses done at the school-year level. Application and enrollment measured in the summer and fall following expected high school graduation. Enrollment is unconditional on application.

Figure 7
Estimated Effect of HAIL Scholarship on Application, Admission, and Enrollment to UM by Number of HAIL Students in School (First and Second HAIL Cohorts)

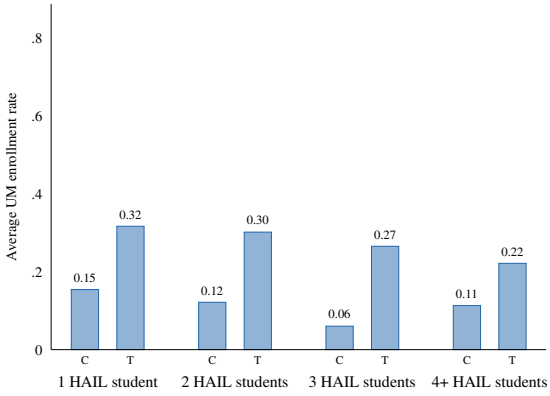
(a) Applied



(b) Admitted



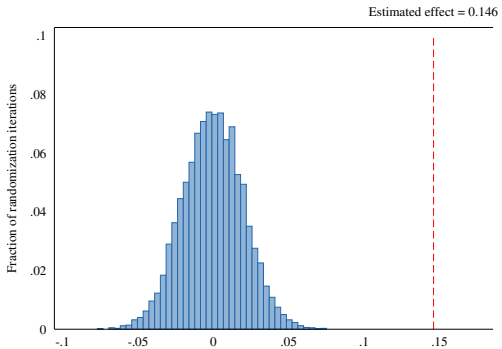
(c) Enrolled



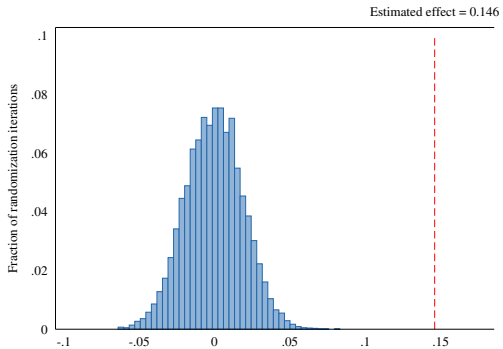
Source: Michigan administrative data and University of Michigan Office of Enrollment Management data.
Notes: All analyses done at the school-year level. Application, admission and enrollment measured in the summer and fall following expected high school graduation. Admission and enrollment are unconditional on application. Schools with 1 HAIL student make up 24% of sample, while schools with 2, 3, and 4 or more HAIL students represent 21%, 13%, and 42% of the sample, respectively.

Figure 8
Randomization-Based Inference

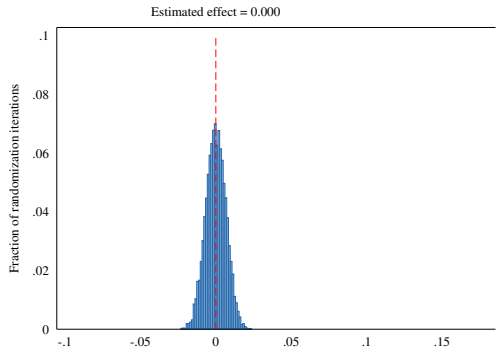
(a) Highly competitive or above



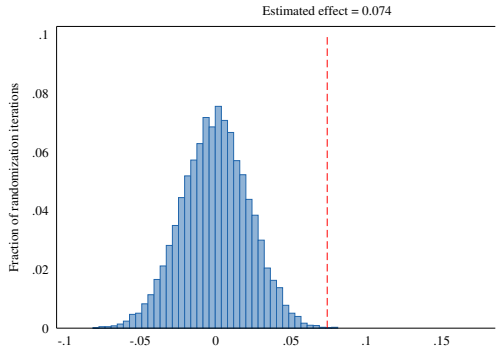
(b) UM



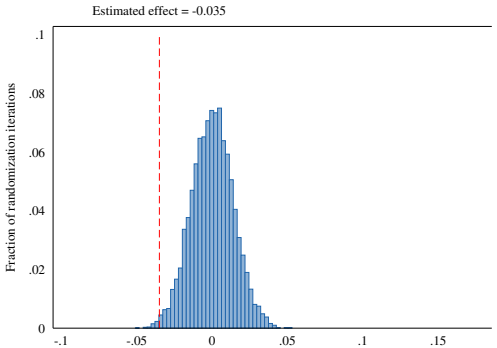
(c) Highly competitive or above other than UM



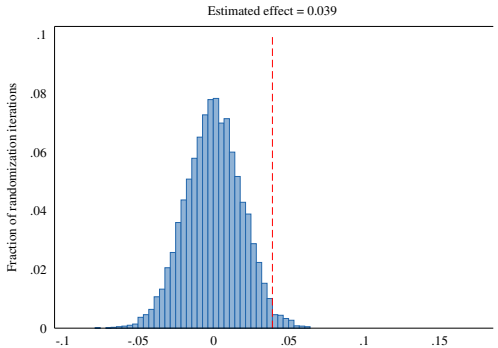
(d) Four-year



(e) Two-year

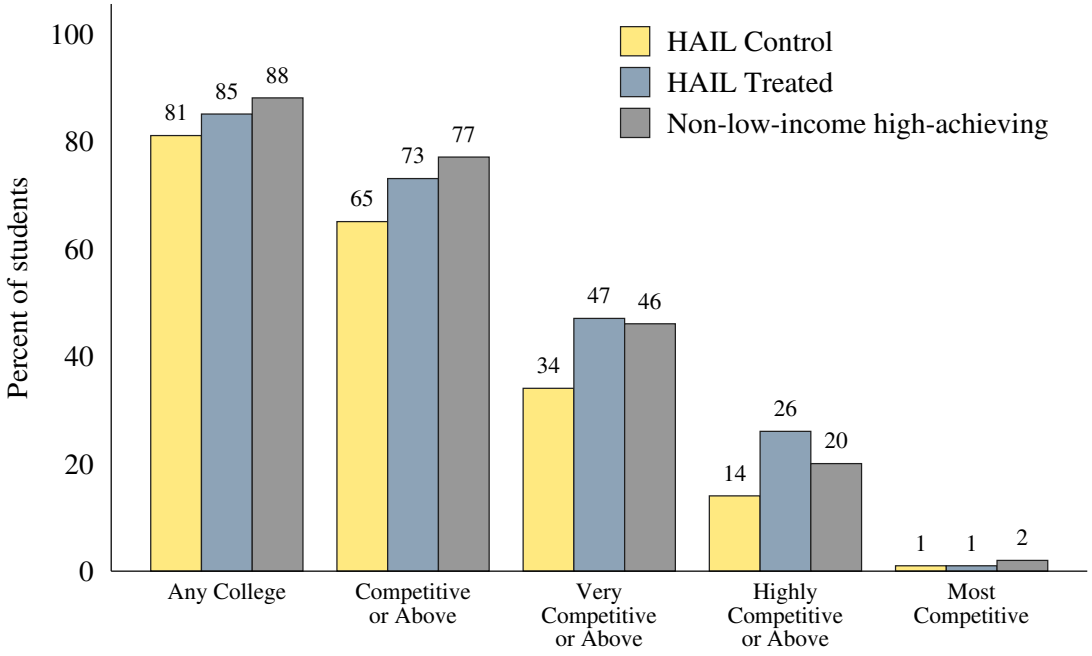


(f) Any



Notes: Each simulated treatment effect comes from first randomly assigning schools to treatment using the same randomization algorithm used for true assignment, then running a regression of the outcome on "treatment" status, including controls for strata. Exact p-value is calculated as the number of simulated effects greater in absolute value than the estimated effect.

Figure 9
Selectivity of Colleges Attended by High-Achieving Michigan Students, by Income and HAIL Treatment Status (First and Second HAIL Cohorts)



Source: Michigan administrative data and National Student Clearinghouse data.
Notes: Sample is 11th grade students in Michigan public schools in 2015 and 2016 who meet HAIL GPA and ACT/SAT criteria. College enrollment measured at first institution attended in fall following expected high school graduation. Low-income means eligible for free or reduced-price lunch in 11th grade. Selectivity categories from Barron's selectivity index.

References

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Appendices

A HAIL Materials

A.1 Student Packet

Exhibit 1 Front view of packet

Exhibit 2 Back view of packet

Exhibit 3 Inside flap of packet

Exhibit 4 Open view of packet; insert materials

Exhibit 5 Packet insert: Becoming a Wolverine Guide

A.2 Parent Letter

Dear Parent or Guardian of <<first name>> <<last name>>:

Success in life is due, in part, to seizing opportunities as they are presented. Since your child is an excellent student, we want to offer a potentially transformative college opportunity: If <<first name>> applies and is admitted to the University of Michigan - Ann Arbor, your child will be awarded the HAIL Scholarship covering the entire cost of U-M tuition and fees for four years. This is an offer we are delighted to make, worth approximately $60,000. Furthermore, after a review of their financial aid applications, your student will likely be eligible for additional aid to cover other costs such as housing and textbooks.

The ability to pay for college shouldn't determine whether or not a child attends. All academically high-achieving seniors, like <<first name>>, have worked hard and challenged themselves throughout high school, and deserve access to an outstanding college experience. A world of opportunity is within reach in Ann Arbor–relatively close to home–where one of the top 25 universities in the world offers the resources and support that enables our students to stay in school, graduate, and achieve great things.

<<first name>> should have recently received a separate packet in the mail with more information on applying to Michigan. We know the process can be challenging, and we want to assure you that we're here to support <<first name>> and make it as easy as possible.

We encourage your student to apply for admission by our November 1 Early Action deadline, or no later than our February 1 Regular Decision deadline. Our brochure shows the steps to applying through the Common Application, with the $75 fee waived. We will also waive the $25 application fee for the CSS/Profile, which is available October 1 and will enable your student to be considered for additional aid from U-M. The Free Application for Federal Student Aid (FAFSA) will be open January 1, 2016, and will likely provide your student additional federal aid to cover other costs.

You and <<first name>> can also visit a special website together to find out more information about how your student was selected for this scholarship, as well as contact information for personal U-M admissions and financial aid counselors, and a place to sign up for a free U-M t-shirt. Your student's packet contains their personalized website address.

At Michigan, we're deeply committed to college access and equity for Michigan high school students. I'm excited to offer this unique opportunity to attend one of the world's premier universities with tuition and fees completely covered, should your student apply and be admitted.

If you have any questions, do not hesitate to contact Jody Gore in our Office of Undergraduate Admissions at 734-764-7433, or Steven Foster in our Office of Financial Aid at 734-763-2941.

Sincerely,
Kedra Ishop, PhD
Associate Vice President
Office of Enrollment Management

A.3 Principal Letter

Dear {PRINCIPAL FIRST} {PRINCIPAL LAST},

I'm delighted to inform you that several seniors in your school are eligible for our pilot HAIL Scholarship, an outstanding offer of four years of free in-state tuition and fees at the University of Michigan - Ann Arbor, a value of about $60,000 per student. Furthermore, they will likely qualify for more aid to cover additional expenses such as housing and textbooks if they apply for aid.

As a public institution committed to the well-being of the residents of the state of Michigan, we want to increase academic opportunities among Michigan's high-achieving, low-income teens. The HAIL Scholarship is a unique effort to show talented seniors who qualify for free or reduced lunch that a world of opportunity is accessible relatively close to home.

The list of your students who qualify for the scholarship is attached. We hope you might meet with them and tell them a little about the University of Michigan, our stellar academic ranking, renowned professors, and near-limitless list of majors. You can see more at admissions.umich.edu.

The students will receive an information packet from us, which outlines how they apply to Michigan through the Common Application - with their $75 admissions fee waived - and instructions on how to file the correct forms and documentation for additional financial aid. Students will need to file the Free Application for Federal Student Aid (FAFSA) when it opens Jan. 1, and the CSS/Profile, which opens Oct. 1, to receive likely additional aid to cover other expenses. We will waive the $25 CSS/Profile processing fee.

Students will also be given a link to a personalized scholarship website, which provides even more clarification about the scholarship, and a connection to personal U-M admissions and financial aid counselors.

We are excited to offer this special scholarship opportunity, and we hope your eligible students take advantage of it by applying before our Early Action deadline of November 1, or no later than our Regular Decision deadline of February 1.

If you have any questions, please feel free to contact Jody Gore in the Office of Undergraduate Admissions at 734-764-7433, Steven Foster in the Office of Financial Aid at 734-763-2941, or your school's U-M admissions counselor, who can be found here: http://admissions.umich.edu/contact-us Go Blue!

Sincerely,
Kedra Ishop, PhD
Associate Vice President
Office of Enrollment Management

University of Michigan - Ann Arbor HAIL Scholarship-eligible students.
Please inform your University of Michigan - Ann Arbor admissions counselor if a student no longer attends your school.

{STUDENT FIRST} {STUDENT LAST}, {BIRTHDATE}

B Appendix Tables

Appendix Table 1
Number of Students in Schools in Treatment and Control Group, by Cohort

	Number of schools	Number of students
First cohort		
Treatment	262	1,057
Control	267	1,051
Total Y1	529	2,108
Second cohort		
Treatment (from Y1)	211	832
Treatment (newly randomized)	27	43
Treated in Y1, no HAIL students in Y2	51	-
Total Treatment	238	875
Control (from Y1)	227	867
Control (newly randomized)	32	60
Control in Y1, no HAIL students in Y2	40	-
Total Control	259	927
Total Y2	497	1,802

Source: Michigan administrative data.

Appendix Table 2
Balance Table: School Characteristics by Subgroup (First and Second HAIL Cohorts)

	Upper Peninsula			West Central			Southeast		
	Control	Treatment	P-value	Control	Treatment	P-value	Control	Treatment	P-value
Upper Peninsula	-	-	-	-	-	-	-	-	-
West Central	-	-	-	-	-	-	-	-	-
Southeast	-	-	-	-	-	-	-	-	-
Suburban	0.000	0.000	-	0.157	0.176	0.429	0.673	0.701	0.944
				(0.024)	(0.025)		(0.032)	(0.033)	
City	0.000	0.000	-	0.153	0.118	0.294	0.2	0.1	0.338
				(0.023)	(0.021)		(0.025)	(0.022)	
Rural	1.000	1.000	-	0.691	0.706	0.878	0.175	0.188	0.439
				(0.030)	(0.030)		(0.026)	(0.028)	
Distance from UM	243.3	268.1	0.139	97.5	98.8	0.544	32.2	36.7	0.004
	(9.872)	(10.240)		(2.138)	(2.155)		(1.044)	(1.110)	
Proportion female	0.569	0.615	0.369	0.563	0.593	0.365	0.580	0.617	0.215
	(0.041)	(0.048)		(0.023)	(0.024)		(0.024)	(0.022)	
Proportion white or Asian	0.894	0.904	0.818	0.868	0.861	0.774	0.772	0.803	0.472
	(0.028)	(0.027)		(0.016)	(0.017)		(0.025)	(0.022)	
Proportion black	0.034	0.019	0.434	0.052	0.055	0.802	0.165	0.148	0.734
	(0.016)	(0.016)		(0.010)	(0.011)		(0.022)	(0.020)	
Proportion other race/ethnicity	0.072	0.077	0.809	0.080	0.083	0.867	0.063	0.049	0.444
	(0.024)	(0.023)		(0.013)	(0.013)		(0.014)	(0.011)	
Proportion free lunch eligible	0.702	0.575	0.065	0.690	0.671	0.500	0.732	0.756	0.320
	(0.039)	(0.049)		(0.022)	(0.022)		(0.021)	(0.019)	
Proportion reduced-price lunch eligible	0.298	0.425	0.065	0	0	0.500	0.268	0.244	0.320
	(0.039)	(0.049)		(0.022)	(0.022)		(0.021)	(0.019)	
Average SAT (or equivalent)	1253	1252	0.846	1252	1257	0.318	1257	1265	0.252
	(7.340)	(8.268)		(4.033)	(4.094)		(4.145)	(4.696)	
Average GPA	3.846	3.850	0.813	3.831	3.837	0.659	3.806	3.822	0.170
	(0.018)	(0.017)		(0.008)	(0.008)		(0.009)	(0.009)	
Proportion limited English proficient	0.000	0.000	-	0.003	0.003	0.898	0.003	0.006	0.351
				(0.002)	(0.001)		(0.002)	(0.003)	
Proportion special ed	0.000	0.005	0.286	0.011	0.021	0.339	0.009	0.006	0.523
	(0.000)	(0.005)		(0.005)	(0.007)		(0.004)	(0.003)	
Proportion who sent ACT/SAT scores to UM	0.305	0.286	0.605	0.372	0.360	0.679	0.380	0.426	0.273
	(0.037)	(0.042)		(0.023)	(0.023)		(0.025)	(0.025)	
UM application rate in 2015	0.045	0.025	0.009	0.055	0.042	0.011	0.090	0.084	0.497
	(0.006)	(0.004)		(0.004)	(0.003)		(0.007)	(0.009)	
Missing 2015 app rate	0.013	0.000	0.335	0.000	0.013	0.080	0.005	0.036	0.023
	(0.013)	(0.000)		(0.000)	(0.007)		(0.005)	(0.013)	
# of 11th grade students in school	94.4	77.8	0.199	162.9	145.5	0.151	253.8	242.8	0.081
	(10.008)	(7.832)		(6.832)	(6.848)		(11.257)	(11.075)	
# of HAIL students in school	2.9	2.8	0.789	3.6	3.4	0.849	4.3	4.8	0.921
	(0.235)	(0.312)		(0.159)	(0.187)		(0.282)	(0.320)	
F-test p-value		0.000			0.000			0.000	
Number of schools	79	65	144	236	238	474	211	197	408
Number of students	231	185	416	842	804	1646	905	943	1848

Appendix Table 2 *(Continued)*
Balance Table: School Characteristics by Subgroup (First and Second HAIL Cohorts)

	Suburb			City			Rural		
	Control	Treatment	P-value	Control	Treatment	P-value	Control	Treatment	P-value
Upper Peninsula	0.000	0.000	-	0.000	0.000	-	0.283	0.241	0.235
							(0.027)	(0.026)	
West Central	0.207	0.233	0.602	0.529	0.560	0.784	0.584	0.622	0.320
	(0.030)	(0.032)		(0.061)	(0.071)		(0.030)	(0.030)	
Southeast	0.793	0.767	0.602	0.471	0.440	0.784	0.133	0.137	0.917
	(0.030)	(0.032)		(0.061)	(0.071)		(0.020)	(0.021)	
Suburban	-	-	-	-	-	-	-	-	-
City	-	-	-	-	-	-	-	-	-
Rural	-	-	-	-	-	-	-	-	-
Distance from UM	46.8	52.3	0.150	65.1	64.5	0.829	129.9	131.6	0.856
	(2.484)	(2.570)		(5.258)	(4.996)		(5.485)	(5.695)	
Proportion female	0.557	0.620	0.054	0.574	0.575	0.975	0.579	0.601	0.424
	(0.025)	(0.021)		(0.042)	(0.052)		(0.022)	(0.023)	
Proportion white or Asian	0.845	0.810	0.132	0.574	0.574	0.835	0.890	0.916	0.156
	(0.021)	(0.021)		(0.049)	(0.059)		(0.015)	(0.012)	
Proportion black	0.104	0.151	0.037	0.308	0.212	0.115	0.036	0.022	0.186
	(0.018)	(0.020)		(0.049)	(0.048)		(0.009)	(0.007)	
Proportion other race/ethnicity	0.051	0.039	0.406	0.118	0.214	0.082	0.074	0.062	0.428
	(0.013)	(0.008)		(0.030)	(0.046)		(0.012)	(0.010)	
Proportion free lunch eligible	0.712	0.740	0.224	0.838	0.768	0.192	0.675	0.646	0.402
	(0.022)	(0.019)		(0.030)	(0.050)		(0.021)	(0.021)	
Proportion reduced-price lunch eligible	0.288	0.260	0.224	0.162	0.232	0.192	0.325	0.354	0.402
	(0.022)	(0.019)		(0.030)	(0.050)		(0.021)	(0.021)	
Average SAT (or equivalent)	1263	1268	0.833	1252	1250	0.875	1249	1256	0.174
	(4.380)	(4.683)		(7.296)	(9.939)		(3.804)	(3.935)	
Average GPA	3.788	3.820	0.013	3.828	3.841	0.671	3.845	3.839	0.594
	(0.010)	(0.009)		(0.016)	(0.024)		(0.008)	(0.008)	
Proportion limited English proficient	0.002	0.003	0.772	0.012	0.019	0.306	0.000	0.001	0.157
	(0.002)	(0.001)		(0.006)	(0.012)		(0.000)	(0.001)	
Proportion special ed	0.013	0.011	0.599	0.000	0.011	0.278	0.008	0.015	0.252
	(0.007)	(0.006)		(0.000)	(0.010)		(0.003)	(0.006)	
Proportion who sent ACT/SAT scores to UM	0.391	0.397	0.730	0.386	0.489	0.160	0.343	0.342	0.885
	(0.025)	(0.024)		(0.044)	(0.056)		(0.021)	(0.022)	
UM application rate in 2015	0.089	0.078	0.329	0.110	0.098	0.928	0.043	0.034	0.009
	(0.007)	(0.009)		(0.015)	(0.014)		(0.003)	(0.002)	
Missing 2015 app rate	0.006	0.028	0.062	0.000	0.040	0.151	0.004	0.011	0.300
	(0.006)	(0.012)		(0.000)	(0.028)		(0.004)	(0.006)	
# of 11th grade students in school	288	262.3	0.018	207.1	199.4	0.814	121.2	112.4	0.253
	(12.401)	(11.421)		(13.533)	(20.064)		(4.790)	(4.859)	
# of HAIL students in school	4.8	5.2	0.986	4.4	4.7	0.160	3	2.9	0.724
	(0.283)	(0.302)		(0.549)	(0.888)		(0.119)	(0.124)	
F-test p-value		0.000			0.002			0.000	
Number of schools	179	180	359	68	50	118	279	270	549
Number of students	852	932	1784	297	233	530	829	767	1596

Appendix Table 2 *(Continued)*
Balance Table: School Characteristics by Subgroup (First and Second HAIL Cohorts)

	Male			Female		
	Control	Treatment	P-value	Control	Treatment	P-value
Upper Peninsula	0.150	0.121	0.294	0.144	0.118	0.267
	(0.018)	(0.017)		(0.017)	(0.016)	
West Central	0.446	0.451	0.837	0.449	0.456	0.813
	(0.026)	(0.027)		(0.024)	(0.024)	
Southeast	0.404	0.428	0.600	0.407	0.426	0.606
	(0.025)	(0.027)		(0.024)	(0.024)	
Suburban	0.360	0.405	0.293	0.343	0.400	0.083
	(0.025)	(0.026)		(0.023)	(0.024)	
City	0.129	0.098	0.174	0.134	0.095	0.065
	(0.017)	(0.016)		(0.016)	(0.014)	
Rural	0.512	0.497	0.893	0.523	0.506	0.637
	(0.026)	(0.027)		(0.024)	(0.024)	
Distance from UM	93.6	91.7	0.869	91.4	92.7	0.794
	(4.241)	(4.132)		(3.791)	(3.877)	
Proportion female	-	-	-	-	-	
Proportion white or Asian	0.864	0.853	0.547	0.832	0.837	0.736
	(0.015)	(0.017)		(0.015)	(0.015)	
Proportion black	0.066	0.061	0.794	0.096	0.101	0.839
	(0.011)	(0.011)		(0.012)	(0.012)	
Proportion other race/ethnicity	0.070	0.086	0.296	0.072	0.062	0.450
	(0.011)	(0.013)		(0.010)	(0.009)	
Proportion free lunch eligible	0.710	0.681	0.345	0.693	0.698	0.765
	(0.019)	(0.020)		(0.018)	(0.017)	
Proportion reduced-price lunch eligible	0.290	0.319	0.345	0.307	0.302	0.765
	(0.019)	(0.020)		(0.018)	(0.017)	
Average SAT (or equivalent)	1275	1278	0.697	1245	1249	0.393
	(3.565)	(4.102)		(3.184)	(3.324)	
Average GPA	3.778	3.786	0.466	3.851	3.855	0.566
	(0.008)	(0.009)		(0.006)	(0.006)	
Proportion limited English proficient	0.003	0.011	0.203	0.002	0.003	0.452
	(0.002)	(0.005)		(0.001)	(0.002)	
Proportion special ed	0.019	0.017	0.897	0.004	0.009	0.235
	(0.006)	(0.006)		(0.002)	(0.004)	
Proportion who sent ACT/SAT scores to UM	0.400	0.422	0.607	0.337	0.350	0.711
	(0.021)	(0.022)		(0.018)	(0.018)	
UM application rate in 2015	0.072	0.061	0.062	0.071	0.059	0.048
	(0.004)	(0.005)		(0.004)	(0.004)	
Missing 2015 app rate	0.003	0.009	0.262	0.002	0.021	0.009
	(0.003)	(0.005)		(0.002)	(0.007)	
# of 11th grade students in school	205	199.5	0.282	201.7	188.9	0.146
	(7.420)	(7.793)		(7.041)	(6.790)	
# of HAIL students in school	4.5	4.7	0.726	4.2	4.3	0.673
	(0.177)	(0.214)		(0.161)	(0.185)	
F-test p-value		0.132			0.000	
Number of schools	381	348	729	432	423	855
Number of students	853	784	1637	1125	1148	2273

Appendix Table 2 *(Continued)*
Balance Table: School Characteristics by Subgroup (First and Second HAIL Cohorts)

	White or Asian			Black			Other race/ethnicity		
	Control	Treatment	P-value	Control	Treatment	P-value	Control	Treatment	P-value
Upper Peninsula	0.156	0.135	0.320	0.059	0.019	0.147	0.137	0.135	0.960
	(0.017)	(0.016)		(0.024)	(0.013)		(0.035)	(0.035)	
West Central	0.469	0.485	0.587	0.327	0.314	0.876	0.558	0.562	0.826
	(0.023)	(0.023)		(0.047)	(0.046)		(0.051)	(0.051)	
Southeast	0.375	0.380	0.874	0.614	0.667	0.486	0.305	0.302	0.842
	(0.022)	(0.022)		(0.049)	(0.046)		(0.047)	(0.047)	
Suburban	0.346	0.359	0.654	0.446	0.705	0.001	0.284	0.312	0.903
	(0.022)	(0.022)		(0.050)	(0.045)		(0.047)	(0.048)	
City	0.104	0.079	0.177	0.337	0.162	0.011	0.211	0.229	0.975
	(0.014)	(0.012)		(0.047)	(0.036)		(0.042)	(0.043)	
Rural	0.550	0.562	0.705	0.218	0.133	0.172	0.505	0.458	0.889
	(0.023)	(0.023)		(0.041)	(0.033)		(0.052)	(0.051)	
Distance from UM	95.6	97.7	0.721	66.2	58.1	0.383	96.7	102.5	0.534
	(3.728)	(3.827)		(6.827)	(4.231)		(7.448)	(8.397)	
Proportion female	0.562	0.604	0.061	0.636	0.718	0.153	0.575	0.512	0.452
	(0.016)	(0.016)		(0.044)	(0.040)		(0.049)	(0.047)	
Proportion white or Asian	-	-		-	-	-	-	-	-
Proportion black	-	-		-	-	-	-	-	-
Proportion other race/ethnicity	-	-		-	-	-	-	-	-
Proportion free lunch eligible	0.690	0.666	0.334	0.812	0.812	0.608	0.775	0.750	0.635
	(0.015)	(0.016)		(0.036)	(0.035)		(0.041)	(0.043)	
Proportion reduced-price lunch eligible	0.310	0.334	0.334	0.188	0.188	0.608	0.225	0.250	0.635
	(0.015)	(0.016)		(0.036)	(0.035)		(0.041)	(0.043)	
Average SAT (or equivalent)	1260	1264	0.358	1239	1250	0.270	1251	1237	0.169
	(2.978)	(3.004)		(7.360)	(6.799)		(8.325)	(8.473)	
Average GPA	3.822	3.831	0.270	3.812	3.791	0.540	3.802	3.841	0.126
	(0.006)	(0.006)		(0.016)	(0.018)		(0.019)	(0.017)	
Proportion limited English proficient	0.002	0.003	0.437	0.010	0.005	0.657	0.007	0.005	0.786
	(0.001)	(0.001)		(0.010)	(0.005)		(0.007)	(0.005)	
Proportion special ed	0.009	0.013	0.438	0.005	0.014	0.550	0.011	0.016	0.595
	(0.003)	(0.004)		(0.005)	(0.011)		(0.011)	(0.012)	
Proportion who sent ACT/SAT scores to UM	0.369	0.374	0.919	0.457	0.384	0.118	0.410	0.419	0.902
	(0.016)	(0.017)		(0.046)	(0.043)		(0.049)	(0.048)	
UM application rate in 2015	0.068	0.055	0.013	0.090	0.086	0.713	0.073	0.059	0.100
	(0.004)	(0.004)		(0.010)	(0.014)		(0.009)	(0.007)	
Missing 2015 app rate	0.004	0.015	0.089	0.000	0.029	0.068	0.000	0.010	0.342
	(0.003)	(0.006)		(0.000)	(0.016)		(0.000)	(0.010)	
# of 11th grade students in school	193	179	0.095	234.1	264	0.364	205.2	227.1	0.467
	(6.640)	(6.365)		(12.684)	(16.545)		(12.777)	(0.000)	
# of HAIL students in school	4	4	0.634	4.8	5.8	0.264	4.8	6.1	0.068
	(0.149)	(0.171)		(0.341)	(0.503)		(0.307)	(0.584)	
F-test p-value		0.007			0.006			0.233	
Number of schools	480	468	948	101	105	206	95	96	191
Number of students	1688	1624	3312	162	168	330	128	140	268

Source: Michigan administrative data.
Notes: All analyses done at the school-year level. For region and urbancity subgroups, p-values are from a t-test of the coefficient on treatment status from a regression of the characteristic on treatment and strata dummies, estimated on the subgroup. For gender and race, p-values are from separate regressions of school-subgroup-level characteristic on treatment status and strata dummies. F-test p-values are from regressions of treatment status on all characteristics and strata dummies; F-test tests all the school characteristics (not including strata) jointly. Robust standard errors reported.

Appendix Table 3
Estimated Effect of HAIL Scholarship on Application, Admission, and Enrollment to UM by High School Geography, With and Without Covariates (First and Second HAIL Cohorts)

Panel A. Region						
	Southeast		*West Central*		*Upper Peninsula*	
Applied	0.369	0.360	0.462	0.462	0.398	0.415
	(0.031)	(0.031)	(0.029)	(0.027)	(0.059)	(0.056)
	[0.363]		[0.2]		[0.156]	
Admitted	0.156	0.128	0.185	0.176	0.187	0.215
	(0.031)	(0.027)	(0.026)	(0.024)	(0.054)	(0.050)
	[0.202]		[0.116]		[0.335]	
Enrolled	0.142	0.119	0.151	0.144	0.176	0.198
	(0.029)	(0.026)	(0.024)	(0.023)	(0.051)	(0.049)
	[0.167]		[0.085]		[0.08]	
Covariates	N	Y	N	Y	N	Y
Number of schools	408		474		474	
Number of students	1,848		1,646		1,646	
Panel B. Urbanicity						
	Suburb		*City*		*Town or Rural*	
Applied	0.381	0.366	0.296	0.276	0.483	0.483
	(0.031)	(0.030)	(0.063)	(0.061)	(0.028)	(0.027)
	[0.335]		[0.464]		[0.156]	
Admitted	0.156	0.119	0.057	0.000	0.225	0.221
	(0.029)	(0.025)	(0.067)	(0.057)	(0.026)	(0.024)
	[0.164]		[0.319]		[0.097]	
Enrolled	0.133	0.101	0.114	0.078	0.181	0.180
	(0.027)	(0.024)	(0.061)	(0.051)	(0.024)	(0.023)
	[0.14]		[0.221]		[0.078]	
Covariates	N	Y	N	Y	N	Y
Number of schools	359		118		549	
Number of students	1,784		530		1,596	

Source: Michigan administrative data and University of Michigan Office of Enrollment Management data.
Notes: All analyses done at the school-year level. Coefficients are from separate regressions of outcome on treatment status and strata dummies, estimated on the subgroup. Covariates include all characteristics listed in Table 2. Robust standard errors reported in parentheses. Control mean for subgroup in brackets. Application, admission and enrollment measured in the summer and fall following expected high school graduation. Admission and enrollment are unconditional on application.

Appendix Table 4

Estimated Effect of HAIL Scholarship on Application, Admission, and Enrollment to UM by Selected Student Characteristics, With and Without Covariates (First and Second HAIL Cohorts)

Panel A. Gender						
	Male		*Female*			
Applied	0.398	0.395	0.418	0.415		
	(0.028)	(0.027)	(0.025)	(0.023)		
	[0.286]		[0.239]			
Admitted	0.138	0.131	0.188	0.184		
	(0.024)	(0.022)	(0.022)	(0.020)		
	[0.139]		[0.143]			
Enrolled	0.114	0.110	0.163	0.164		
	(0.022)	(0.021)	(0.021)	(0.020)		
	[0.105]		[0.115]			
Covariates	N	Y	N	Y		
Number of schools	729		855			
Number of students	1637		2273			
Panel B. Race/Ethnicity						
	White or Asian		*Black*		*Other*	
Applied	0.434	0.433	0.250	0.285	0.242	0.259
	(0.022)	(0.021)	(0.060)	(0.063)	(0.068)	(0.064)
	[0.234]		[0.478]		[0.393]	
Admitted	0.181	0.172	0.070	0.097	0.043	0.053
	(0.019)	(0.017)	(0.059)	(0.056)	(0.062)	(0.063)
	[0.129]		[0.283]		[0.258]	
Enrolled	0.153	0.147	0.034	0.043	0.072	0.083
	(0.018)	(0.016)	(0.055)	(0.052)	(0.058)	(0.060)
	[0.103]		[0.234]		[0.199]	
Covariates	N	Y	N	Y	N	Y
Number of schools	948		206		191	
Number of students	3,312		330		268	

Appendix Table 4 *(Continued)*
Estimated Effect of HAIL Scholarship on Application, Admission, and Enrollment to UM by Selected Student Characteristics, With and Without Covariates (First and Second HAIL Cohorts)

Panel C. Free or Reduced-Price Lunch Eligibility				
	Free Lunch		*Reduced-Price*	
Applied	0.416	0.414	0.406	0.405
	(0.023)	(0.022)	(0.032)	(0.030)
	[0.27]		[0.245]	
Admitted	0.169	0.159	0.138	0.132
	(0.021)	(0.019)	(0.028)	(0.026)
	[0.151]		[0.146]	
Enrolled	0.145	0.138	0.108	0.105
	(0.020)	(0.018)	(0.026)	(0.024)
	[0.116]		[0.118]	
Covariates	N	Y	N	Y
Number of schools	923		607	
Number of students	2,748		1,162	
Panel D. Pre-Treatment Interest in UM				
	Sent ACT/SAT Scores to UM		*Did Not Send Scores to UM*	
Applied	0.370	0.366	0.431	0.430
	(0.029)	(0.028)	(0.023)	(0.022)
	[0.421]		[0.161]	
Admitted	0.168	0.156	0.163	0.157
	(0.030)	(0.027)	(0.019)	(0.018)
	[0.255]		[0.081]	
Enrolled	0.156	0.148	0.138	0.132
	(0.028)	(0.026)	(0.018)	(0.017)
	[0.199]		[0.059]	
Covariates	N	Y	N	Y
Number of schools	663		882	
Number of students	1,514		2,396	

Source: Michigan administrative data and University of Michigan Office of Enrollment Management data.
Notes: All analyses done at the school-year level. Coefficients are from separate regressions of school-subgroup-level outcome rate on treatment status and strata dummies. Covariates include all characteristics listed in Table 2 and are at the school-subgroup level. Robust standard errors reported in parentheses. Control mean for subgroup in brackets. UM application, admission and enrollment measured in the summer and fall following expected high school graduation. Admission and enrollment are unconditional on application.

Appendix Table 5
Estimated Effect of HAIL Scholarship on College Choice, With and Without Covariates (First and Second HAIL Cohorts)

College attended	Treatment effect		Control mean
Highly competitive or above	0.146	0.141	0.135
	(0.018)	(0.017)	
UM	0.146	0.139	0.107
	(0.016)	(0.016)	
Highly competitive or above other than UM	0.000	0.002	0.028
	(0.007)	(0.007)	
Four-year	0.074	0.080	0.675
	(0.020)	(0.020)	
Two-year	-0.035	-0.036	0.116
	(0.013)	(0.013)	
Any	0.039	0.045	0.791
	(0.018)	(0.018)	
In Michigan	0.045	0.047	0.727
	(0.020)	(0.020)	
Public in Michigan	0.062	0.064	0.645
	(0.021)	(0.021)	
Outside Michigan	-0.006	-0.003	0.064
	(0.010)	(0.010)	
Covariates	N	Y	
Number of schools		1,026	
Number of students		3,910	

Source: Michigan administrative data and National Student Clearinghouse data.
Notes: All analyses done at the school-year level. Coefficients are from regressions of outcome on treatment status and strata dummies. Covariates include all characteristics listed in Table 2. Robust standard errors reported. Enrollment is measured at the first college attended in the fall following expected high school graduation and is unconditional on any college enrollment.

Appendix Table 6
Estimated Effect of HAIL Scholarship on College Choice by Selected School and Student Characteristics, With and Without Covariates (First and Second HAIL Cohorts)

Panel A. Region

	Southeast		*West Central*		*Upper Peninsula*	
Highly competitive or above	0.129	0.108	0.163	0.156	0.160	0.180
	(0.030)	(0.028)	(0.024)	(0.022)	(0.052)	(0.052)
	[0.199]		[0.092]		[0.091]	
UM	0.133	0.108	0.155	0.148	0.167	0.191
	(0.029)	(0.027)	(0.022)	(0.022)	(0.052)	(0.050)
	[0.162]		[0.068]		[0.078]	
Four-year	0.041	0.045	0.114	0.120	0.037	0.049
	(0.029)	(0.030)	(0.031)	(0.031)	(0.060)	(0.062)
	[0.774]		[0.579]		[0.697]	
Any	0.024	0.022	0.045	0.056	0.061	0.069
	(0.026)	(0.027)	(0.027)	(0.028)	(0.055)	(0.057)
	[0.84]		[0.758]		[0.757]	
Covariates	N	Y	N	Y	N	Y
Number of schools	408		474		144	
Number of students	1,848		1,646		416	

Panel B. Urbanicity

	Suburb		*City*		*Town or Rural*	
Highly competitive or above	0.136	0.100	0.079	0.072	0.181	0.184
	(0.029)	(0.025)	(0.063)	(0.059)	(0.024)	(0.022)
	[0.163]		[0.249]		[0.088]	
UM	0.126	0.095	0.078	0.052	0.187	0.188
	(0.027)	(0.025)	(0.058)	(0.052)	(0.023)	(0.022)
	[0.139]		[0.203]		[0.063]	
Four-year	0.039	0.034	0.007	0.029	0.103	0.115
	(0.030)	(0.029)	(0.064)	(0.069)	(0.030)	(0.030)
	[0.746]		[0.704]		[0.622]	
Any	0.014	0.013	0.018	0.049	0.053	0.064
	(0.027)	(0.027)	(0.056)	(0.064)	(0.026)	(0.026)
	[0.838]		[0.783]		[0.762]	
Covariates	N	Y	N	Y	N	Y
Number of schools	359		118		549	
Number of students	1,784		530		1,596	

Appendix Table 6 *(Continued)*
Estimated Effect of HAIL Scholarship on College Choice by Selected School and Student Characteristics, With and Without Covariates (First and Second HAIL Cohorts)

Panel C. Gender						
	Male		*Female*			
Highly competitive or above	0.110	0.107	0.167	0.167		
	(0.023)	(0.022)	(0.021)	(0.020)		
	[0.135]		[0.125]			
UM	0.112	0.108	0.161	0.161		
	(0.022)	(0.020)	(0.020)	(0.019)		
	[0.1]		[0.104]			
Four-year	0.073	0.072	0.086	0.087		
	(0.027)	(0.027)	(0.025)	(0.024)		
	[0.672]		[0.671]			
Any	0.029	0.029	0.055	0.059		
	(0.023)	(0.023)	(0.021)	(0.021)		
	[0.798]		[0.793]			
Covariates	N	Y	N	Y		
Number of schools	729		855			
Number of students	1,637		2,273			
Panel D. Race/Ethnicity						
	White or Asian		*Black*		*Other*	
Highly competitive or above	0.151	0.147	0.061	0.060	0.082	0.099
	(0.018)	(0.017)	(0.057)	(0.052)	(0.057)	(0.059)
	[0.119]		[0.272]		[0.179]	
UM	0.150	0.145	0.018	0.020	0.079	0.097
	(0.017)	(0.016)	(0.052)	(0.049)	(0.056)	(0.058)
	[0.096]		[0.214]		[0.167]	
Four-year	0.072	0.078	-0.041	-0.050	0.167	0.187
	(0.022)	(0.021)	(0.055)	(0.055)	(0.064)	(0.063)
	[0.675]		[0.792]		[0.593]	
Any	0.031	0.036	-0.062	-0.077	0.121	0.146
	(0.018)	(0.018)	(0.049)	(0.049)	(0.055)	(0.054)
	[0.801]		[0.848]		[0.716]	
Covariates	N	Y	N	Y	N	Y
Number of schools	948		206		191	
Number of students	3,312		330		268	

Source: Michigan administrative data and National Student Clearinghouse data.
Notes: All analyses done at the school-year level. For Panels A and B, coefficients are from separate regressions of outcome on treatment status and strata dummies, estimated on the subgroup. For Panels C and D, coefficients are from separate regressions of school-subgroup-level outcome rate on treatment status and strata dummies. Covariates include all characteristics listed in Table 2 and are at the school-subgroup level. Robust standard errors reported in parentheses. Control mean for subgroup in brackets. Enrollment is measured at the first college attended in the fall following expected high school graduation and is unconditional on any college enrollment.

Appendix Table 7 Estimated Effect of HAIL Scholarship on College Persistence, With and Without Covariates (First HAIL Cohort)

	Attended fall following high school graduation			Attended two consecutive falls following high school graduation		
College attended	Treatment effect		Control mean	Treatment effect		Control mean
Highly competitive or above	0.153	0.152	0.129	0.135	0.134	0.126
	(0.024)	(0.020)		(0.023)	(0.020)	
UM	0.147	0.144	0.104	0.128	0.126	0.102
	(0.022)	(0.020)		(0.022)	(0.019)	
Four-year	0.091	0.097	0.651	0.109	0.115	0.557
	(0.028)	(0.028)		(0.029)	(0.029)	
Any	0.057	0.063	0.779	0.079	0.085	0.683
	(0.025)	(0.025)		(0.027)	(0.027)	
Covariates	N	Y		N	Y	
Number of schools	529					
Number of students	2,108					

Source: Michigan administrative data and National Student Clearinghouse data.
Notes: All analyses done at the school-year level. Coefficients are from regressions of outcome on treatment status and strata dummies. Covariates include all characteristics listed in Table 2. Robust standard errors reported. Enrollment is measured at the first college attended in the two falls following expected high school graduation and is unconditional on any college enrollment.

Appendix Table 8
Estimated Effect of HAIL Scholarship on College Persistence by Selected School and Student Characteristics, With and Without Covariates (First HAIL Cohort)

Panel A. Region

	Southeast		*West Central*		*Upper Peninsula*	
Highly competitive or above	0.127	0.148	0.132	0.160	0.016	0.150
	(0.039)	(0.029)	(0.067)	(0.035)	(0.085)	(0.031)
	[0.183]		[0.089]		[0.091]	
UM	0.091	0.146	0.046	0.112	0.057	0.118
	(0.042)	(0.043)	(0.083)	(0.044)	(0.085)	(0.042)
	[0.145]		[0.07]		[0.091]	
Four-year	0.120	0.150	0.119	0.136	0.116	0.112
	(0.030)	(0.028)	(0.029)	(0.026)	(0.039)	(0.036)
	[0.667]		[0.462]		[0.563]	
Any	0.084	0.091	0.105	-0.018	0.089	0.072
	(0.038)	(0.039)	(0.031)	(0.089)	(0.090)	(0.029)
	[0.746]		[0.552]		[0.676]	
Covariates	N	Y	N	Y	N	Y
Number of schools	204		247		78	
Number of students	951		927		230	

Panel B. Urbanicity

	Suburb		*City*		*Town or Rural*	
Highly competitive or above	0.160	0.125	0.016	0.051	0.150	0.152
	(0.035)	(0.031)	(0.085)	(0.083)	(0.031)	(0.027)
	[0.115]		[0.267]		[0.1]	
UM	0.129	0.103	-0.006	-0.025	0.161	0.162
	(0.033)	(0.029)	(0.079)	(0.085)	(0.030)	(0.027)
	[0.096]		[0.234]		[0.076]	
Four-year	0.112	0.110	0.057	0.057	0.118	0.131
	(0.044)	(0.041)	(0.085)	(0.094)	(0.042)	(0.042)
	[0.623]		[0.646]		[0.498]	
Any	0.109	0.109	0.050	0.053	0.067	0.074
	(0.041)	(0.039)	(0.072)	(0.093)	(0.040)	(0.040)
	[0.722]		[0.739]		[0.648]	
Covariates	N	Y	N	Y	N	Y
Number of schools	179		60		290	
Number of students	930		284		894	

Appendix Table 8 *(Continued)*
Estimated Effect of HAIL Scholarship on College Persistence by Selected School and Student Characteristics, With and Without Covariates (First HAIL Cohort)

Panel C. Gender

	Male		*Female*	
Highly competitive or above	0.120	0.110	0.150	0.156
	(0.030)	(0.028)	(0.028)	(0.025)
	[0.118]		[0.115]	
UM	0.119	0.110	0.136	0.142
	(0.029)	(0.026)	(0.026)	(0.024)
	[0.091]		[0.098]	
Four-year	0.116	0.114	0.112	0.113
	(0.039)	(0.038)	(0.036)	(0.034)
	[0.561]		[0.56]	
Any	0.030	0.030	0.105	0.106
	(0.036)	(0.036)	(0.032)	(0.032)
	[0.71]		[0.682]	
Covariates	N	Y	N	Y
Number of schools	384		441	
Number of students	883		1,225	

Panel D. Race/Ethnicity

	White or Asian		*Black*		*Other*	
Highly competitive or above	0.145	0.148	0.100	0.085	0.051	0.060
	(0.024)	(0.021)	(0.076)	(0.064)	(0.072)	(0.076)
	[0.11]		[0.221]		[0.183]	
UM	0.142	0.144	0.016	0.023	0.051	0.058
	(0.023)	(0.020)	(0.067)	(0.062)	(0.071)	(0.074)
	[0.09]		[0.177]		[0.175]	
Four-year	0.105	0.110	-0.018	0.015	0.089	0.082
	(0.031)	(0.030)	(0.089)	(0.105)	(0.090)	(0.088)
	[0.552]		[0.695]		[0.497]	
Any	0.072	0.078	-0.014	0.007	0.047	0.060
	(0.029)	(0.029)	(0.080)	(0.092)	(0.086)	(0.086)
	[0.687]		[0.757]		[0.615]	
Covariates	N	Y	N	Y	N	Y
Number of schools	496		100		114	
Number of students	1,786		165		157	

Source: Michigan administrative data and National Student Clearinghouse data.
Notes: All analyses done at the school-year level. For Panels A and B, coefficients are from separate regressions of outcome on treatment status and strata dummies, estimated on the subgroup. For Panels C and D, coefficients are from separate regressions of school-subgroup-level outcome rate on treatment status and strata dummies. Covariates include all characteristics listed in Table 2 and are at the school-subgroup level. Robust standard errors reported in parentheses. Control mean for subgroup in brackets. Enrollment is measured at the first college attended in the two falls following expected high school graduation and is unconditional on any college enrollment.

Appendix Table 9
Estimated Effect of HAIL Scholarship on Application, Admission, and Enrollment to UM by Historical School Connection to UM and Number of HAIL Students (First and Second HAIL Cohorts): Regression Results

	Applied	Admitted	Enrolled
Panel A. Prior School-Level UM Application Rate			
Treatment	0.483	0.201	0.168
	(0.025)	(0.024)	(0.023)
Prior UM application rate	1.221	0.742	0.644
	(0.178)	(0.179)	(0.174)
Interaction	-0.976	-0.334	-0.217
	(0.219)	(0.238)	(0.240)
Panel B. Prior School-Level UM Enrollment Rate			
Treatment	0.480	0.198	0.169
	(0.024)	(0.023)	(0.021)
Prior UM enrollment rate	2.833	1.727	1.533
	(0.357)	(0.411)	(0.406)
Interaction	-2.655	-0.848	-0.668
	(0.548)	(0.575)	(0.579)
Panel C. Number of HAIL Students in School			
Treatment	0.477	0.209	0.182
	(0.033)	(0.032)	(0.030)
Number of HAIL students	0.019	0.012	0.010
	(0.004)	(0.003)	(0.003)
Interaction	-0.016	-0.009	-0.009
	(0.005)	(0.004)	(0.004)
Number of schools		1,026	

Source: Michigan administrative data and University of Michigan Office of Enrollment Management data.
Notes: All analyses done at the school-year level. Results are from a regression of the outcome on treatment, the named variable and a missing dummy, the interaction of the two, and strata dummies. Robust standard errors estimated. Prior UM application and enrollment rates are for the high school graduating class of 2015.

Appendix Table 10
Estimated Effect of HAIL Scholarship on Enrollment and Persistence at UM Campuses (First HAIL Cohort)

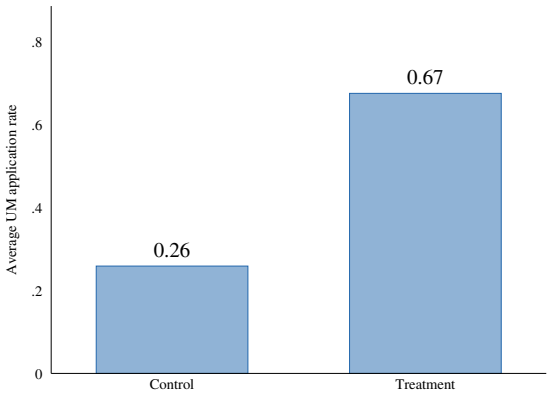
Campus	First Year Enrollment	Second Year Enrollment	Both Year Enrollment
Ann Arbor	0.147	0.163	0.128
	(0.022)	(0.023)	(0.022)
	[0.104]	[0.107]	[0.102]
Flint or Dearborn	0.058	0.023	0.022
	(0.013)	(0.009)	(0.009)
	[0.021]	[0.027]	[0.016]
Any UM campus	0.205	0.186	0.184
	(0.025)	(0.024)	(0.024)
	[0.125]	[0.134]	[0.12]
Number of schools		529	
Number of students		2,108	

Source: Michigan administrative data and National Student Clearinghouse data.
Notes: All analyses done at the school-year level. Coefficients are from regressions of outcome on treatment status and strata dummies. Robust standard errors in parentheses. Control mean in brackets. Enrollment is measured at the first college attended in the two falls following expected high school graduation and is unconditional on any college enrollment.

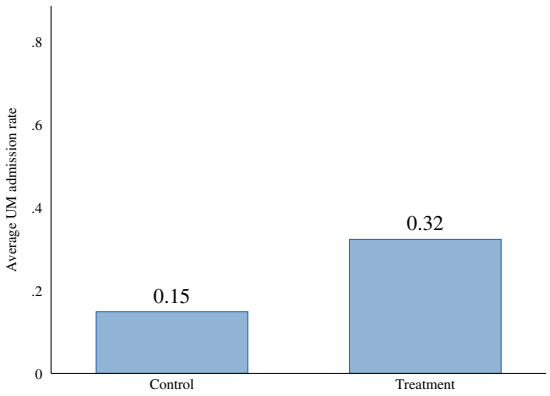
C Appendix Figures

Appendix Figure 1
Estimated Effect of HAIL Scholarship on Application, Admission, and Enrollment to UM (First and Second HAIL Cohorts)

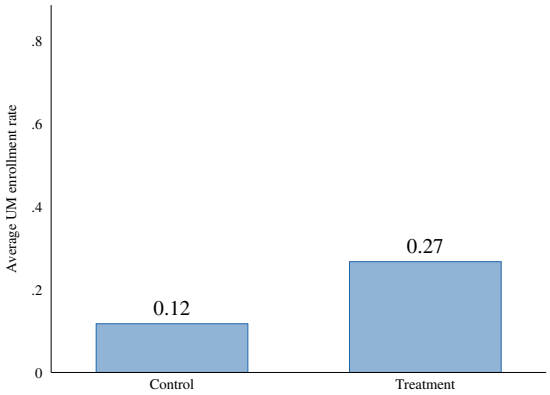
(a) Applied



(b) Admitted

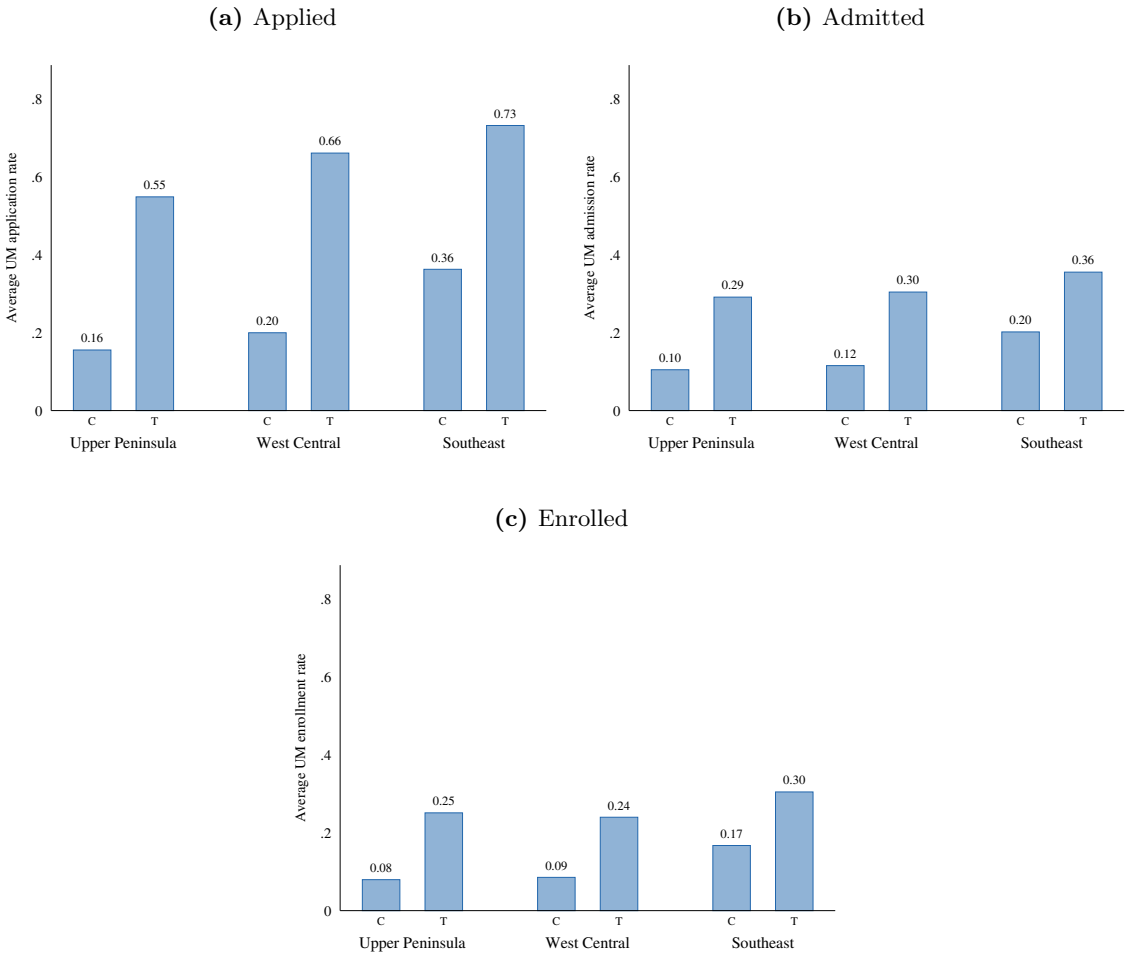


(c) Enrolled



Source: Michigan administrative data and University of Michigan Office of Enrollment Management data.
Notes: All analyses done at the school-year level. Application, admission and enrollment measured in the summer and fall following expected high school graduation. Admission and enrollment are unconditional on application.

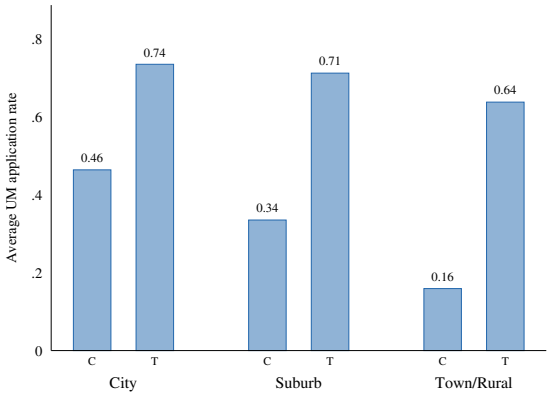
Appendix Figure 2
Estimated Effect of HAIL Scholarship on Application, Admission, and Enrollment to UM by Region (First and Second HAIL Cohorts)



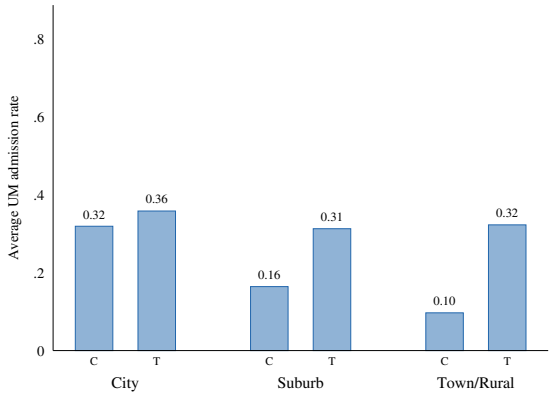
Source: Michigan administrative data and University of Michigan Office of Enrollment Management data.
Notes: All analyses done at the school-year level. Application, admission and enrollment measured in the summer and fall following expected high school graduation. Admission and enrollment are unconditional on application. Schools in the UP make up 14% of sample, while schools in West Central and Southeast Michigan represent 46% and 40% of the sample, respectively.

Appendix Figure 3
Estimated Effect of HAIL Scholarship on Application, Admission, and Enrollment to UM by Urbanicity (First and Second HAIL Cohorts)

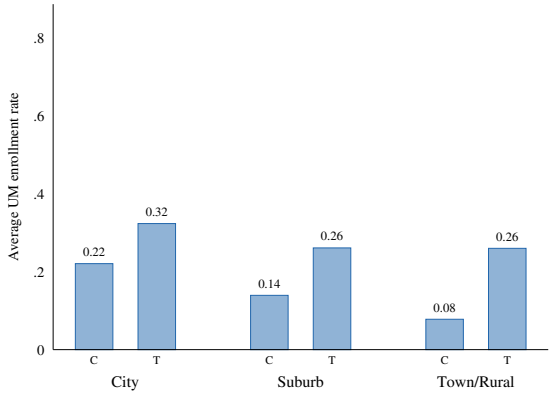
(a) Applied



(b) Admitted

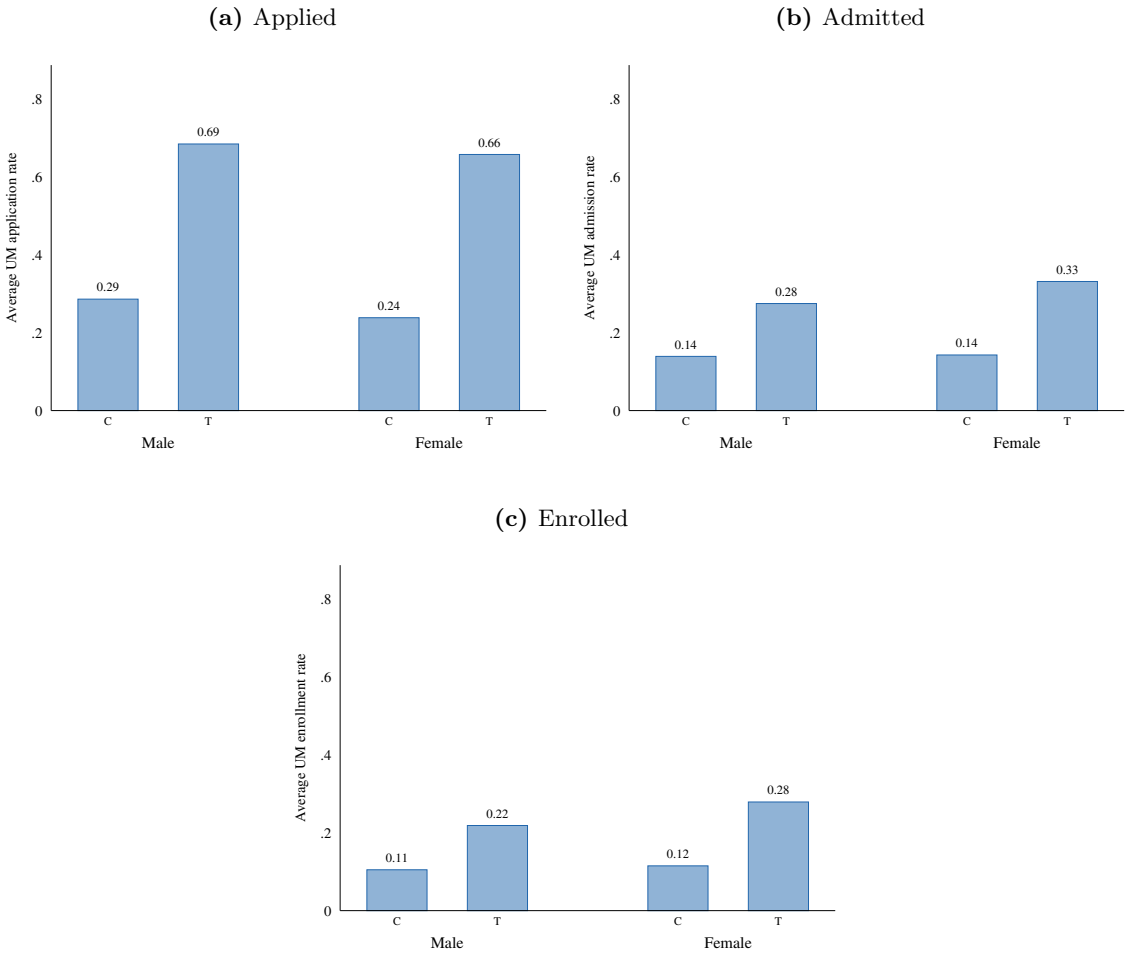


(c) Enrolled



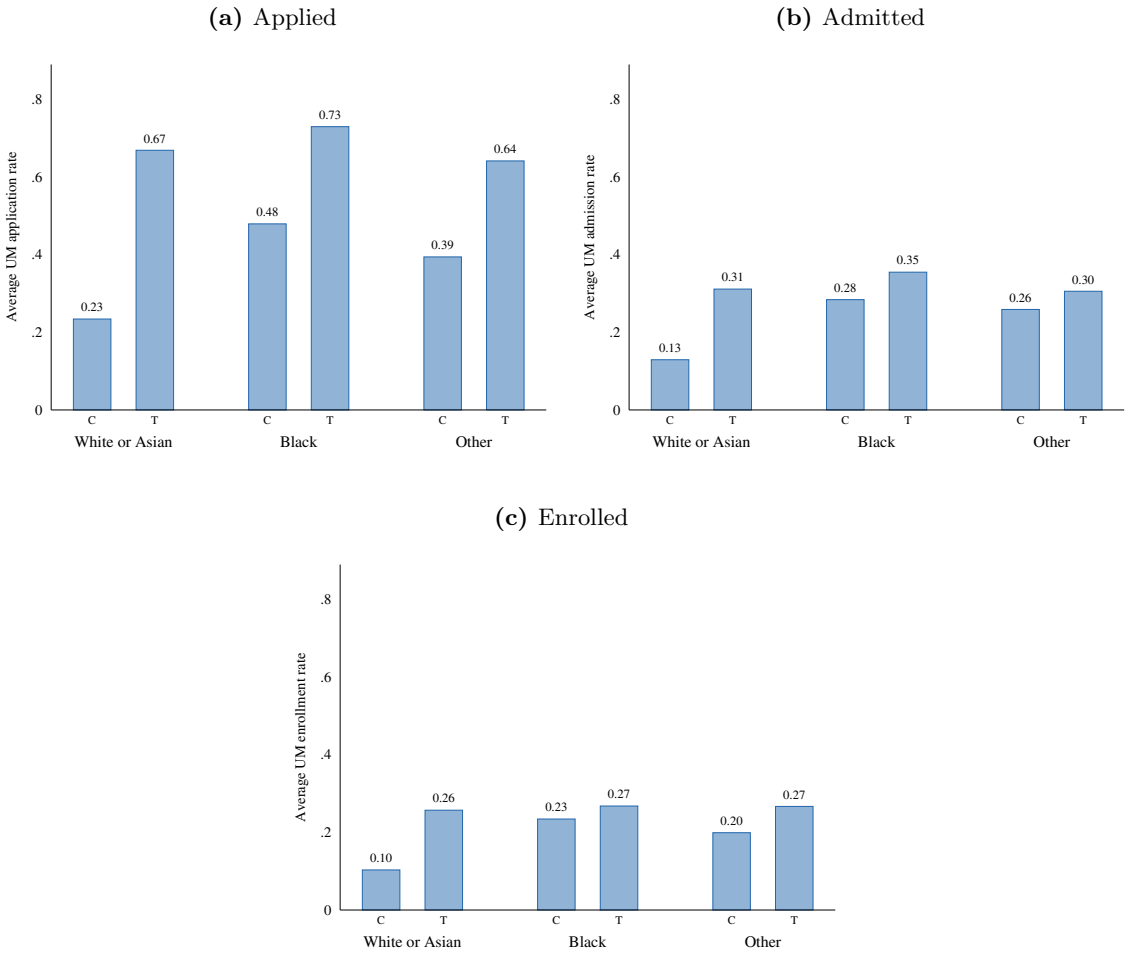
Source: Michigan administrative data and University of Michigan Office of Enrollment Management data.
Notes: All analyses done at the school-year level. Application, admission and enrollment measured in the summer and fall following expected high school graduation. Admission and enrollment are unconditional on application tab.Schools in suburban areas make up 35% of sample, while schools in cities and town or rural areas represent 12% and 54% of the sample, respectively.

Appendix Figure 4
Estimated Effect of HAIL Scholarship on Application, Admission, and Enrollment to UM by Gender (First and Second HAIL Cohorts)



Source: Michigan administrative data and University of Michigan Office of Enrollment Management data.
Notes: Rates are gender-specific school-year averages. Application, admission and enrollment measured in the summer and fall following expected high school graduation. Admission and enrollment are unconditional on application.83% of HAIL schools have at least one female HAIL student; 71% have at least one male. Female students represent 58% of the sample and male students represent 42%.

Appendix Figure 5
Estimated Effect of HAIL Scholarship on Application, Admission, and Enrollment to UM by Race/Ethnicity (First and Second HAIL Cohorts)

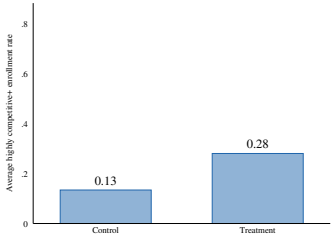


Source: Michigan administrative data and University of Michigan Office of Enrollment Management data.
Notes: Rates are race-specific school-year averages. Application, admission and enrollment measured in the summer and fall following expected high school graduation. Admission and enrollment are unconditional on application. 92% of HAIL schools have at least one white or Asian HAIL student; 20% have at least one black student and 19% have at least one student of another race or ethnicity. White and Asian students represent 85% of the sample; black students and students of another race or ethnicity represent 8% and 7%, respectively.

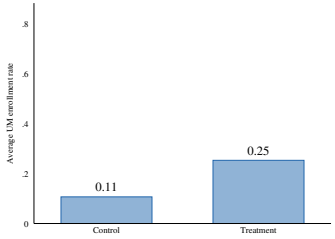
Appendix Figure 6

Estimated Effect of HAIL Scholarship on College Choice (First and Second HAIL Cohorts)

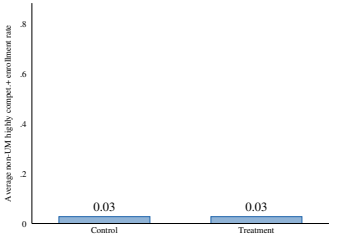
(a) Highly competitive or above



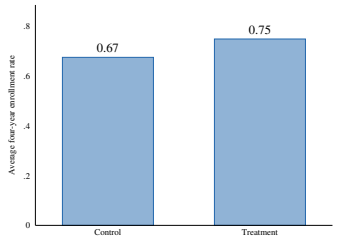
(b) UM



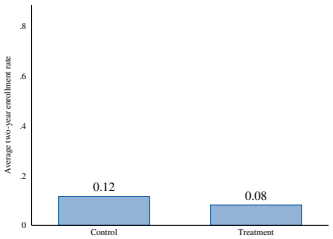
(c) Highly competitive or above other than UM



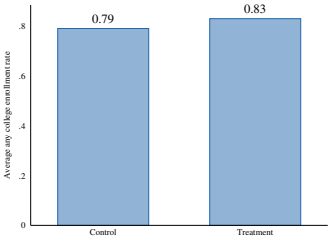
(d) Four-year



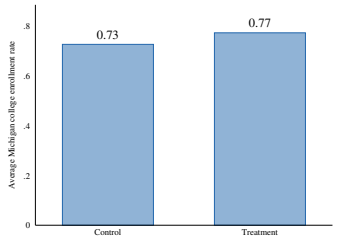
(e) Two-year



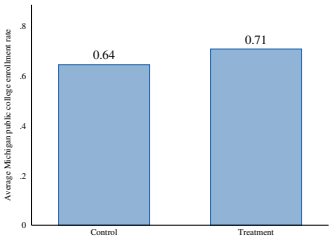
(f) Any



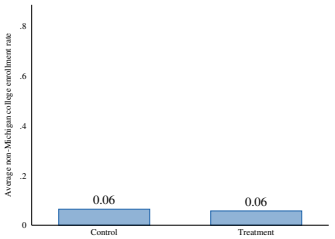
(g) In Michigan



(h) Michigan Public



(i) Not in Michigan



Source: Michigan administrative data and National Student Clearinghouse data.
Notes: All analyses done at the school-year-level. Enrollment measured at the first institution attendend in the fall following expected high school graduation. Enrollment unconditional on any college enrollment.