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Why are Women Underrepresented in Elite Colleges and Universities? A Non-Linear Decomposition Analysis

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Abstract The emerging female advantage in education has received considerable attention in the popular media and recent research. We examine a persistent exception to this trend: women's underrepresentation in America's most competitive colleges and universities. Using nationally generalizable data spanning four decades, we evaluate evidence for three possible explanations. First, we analyze whether men's academic profiles more closely match the admissions preferences of elite institutions. Next, we consider organizational preferences for male applicants. Finally, we test whether women self-select out of elite institutions through their application choices. Using Blinder–Oaxaca non-linear decomposition techniques and multinomial logistic regression, we find that men's advantage in standardized test scores best explains the enrollment gap. Our analyses thus suggest that the gender enrollment gap in elite colleges and universities is a matter of access, not student choice. We discuss the implications of these results for educational equity and college admissions.

Keywords Enrollment · Gender · Non-linear decomposition · Longitudinal data · Stratification · Elite institutions

Introduction

In most sectors of American education, the gender gap means something different now than it did forty years ago. Girls now outscore boys on standardized tests in elementary school, earn

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higher grades in high school, and enroll in and complete postsecondary degrees at higher rates than men (Buchmann and DiPrete 2006; Cho 2007; Duckworth and Seligman 2006; Goldin et al. 2006; Mickelson and Smith 1998; Sax 2008). Female representation in postsecondary education has been skyrocketing since 1972. Women reached parity in college completion as early as 1982 and, in 2007, completed 58 % of the baccalaureate degrees awarded nationally (Snyder and Dillow 2011). However, enrollment in America's most competitive higher education institutions has thus far eluded this wave of gender democratization, with men maintaining an enrollment advantage through the high school class of 2004. In this paper, our objective is to examine three possible explanations for this seemingly "durable inequality" (Tilly 1999), which is an important exception to the emerging female advantage in education.

Women's underrepresentation in elite institutions has important post-baccalaureate implications that help motivate our inquiry. A small proportion of society gains access to elite institutions, but as the labor market is increasingly saturated with bachelor's degree holders, institutional prestige has strengthened as a predictor of post-baccalaureate opportunities (Bowman and Bastedo 2009; Frank and Cook 1995). Earning one's bachelor's degree from a selective institution is one of the strongest predictors of graduate school admission (Attiyeh and Attiyeh 1997). Students with degrees from prestigious institutions also have higher earnings, deeper professional networks, and are disproportionately represented in the upper echelons of corporate management (Bills 2003; Brewer et al. 1999; Kerckhoff et al. 2001; Monks 2000). Equitable access to the most competitive institutions thus conditions access to the top strata of America's educational and labor market opportunity structures.

Through a review of the literature and a conceptual framework focused on student-institution matching, we developed three hypotheses to explain the gender enrollment gap in most-competitive institutions: (a) gender disparities in measures of academic achievement valued by admissions offices; (b) admissions preferences for men; and (c) "undermatching" by qualified female applicants, particularly in STEM fields. Prior research has tested these hypotheses in isolation, and analyses have been based on single cross-sections of data from specific campuses.

Drawing upon a conceptual framework that explains the growth in matching between students and institutions, we find that gender disparities in standardized testing are a stronger explanation for female underrepresentation at elite colleges than undermatching or admissions preferences for men. We test our hypotheses using nationally representative student-level data from the high school senior classes of 1972, 1982, 1992, and 2004. Our goal is to engage two tasks of critical quantitative research (Stage 2007): (a) using large-scale data to reveal educational inequalities and the processes by which institutions perpetuate them and (b) challenging conventional models and analyses to improve understanding of underrepresented groups' (in this analysis, women's) educational opportunities and experiences. After testing hypotheses about both application and admission to selective institutions, we find that it is institutional admissions priorities that impede women's equal enrollment. As such, we reveal a blind spot in arguments that structural obstacles to education for women are a problem of the past.

Literature Review

Achievement Disparities and College Admissions

Prior research suggests women's underrepresentation in elite institutions may be caused by gender disparities in pre-collegiate academic achievement, gender disparities in student application patterns, and/or gender disparities in institutional preferences. Pre-collegiate academic achievement is positively associated with college enrollment, the selectivity of institution attended, and college completion (e.g., Bastedo and Jaquette 2011; Buchmann and DiPrete 2006; Cho 2007; Hearn 1991; Posselt et al. 2012). Interestingly, gender disparities in pre-collegiate academic achievement may contribute to both women's enrollment advantage in some institutional types and their persistent disadvantage in the most competitive ones. Goldin et al. (2006), for example, found that women catching up and surpassing men in high school grades and courses taken explained the growing female advantage in college enrollment and completion since 1970. However, men continue to have higher average SAT math scores than women, and comprised 62.75 % of SAT math scores in the 700–800 range in 2012 (College Board 2012). Alon (2009) showed that the effect of SAT/ACT scores on admissions decisions at selective colleges has increased over time. However, prior research has not examined whether male advantage in the upper distribution of college entrance exams explains the male enrollment advantage in selective institutions.

Only Persell et al. (1992) have examined whether the effect of pre-collegiate academic achievement on a student's college selectivity differs by gender. Using data from the high school senior class of 1982, they found that the effects of high school grades, advanced course taking, and homework time on postsecondary enrollment selectivity were each stronger for men than women. However, because their study modeled only postsecondary enrollment, not application decisions, it is unclear whether these findings were due to qualified women not applying to selective colleges or selective colleges rejecting qualified women. This limitation implies two alternative explanations for the male enrollment advantage in most-competitive institutions: women may be applying to most-competitive institutions at a lower rate than men; or most-competitive admissions offices may have preferences for male applicants, even after controlling for pre-collegiate academic preparation.

Gender Disparities in Who Applies to Selective Colleges

Other researchers have considered whether gender disparities in the application pool may help explain women's underrepresentation in the most competitive colleges. Even after controlling for prior academic achievement, non-academic factors such as gender, parental education and income, race, geographic proximity, and athletics participation, all shape students' likelihood of applying to selective institutions (e.g., Griffith and Rothstein 2009; Klasik 2013). Using data from the high school senior class of 2004, An (2010) found that parental education (i.e., BA or higher) and being Black, Latino, or Asian (as opposed to being White) were positively associated with applying to a selective institution, controlling for prior academic achievement. However, women had a significantly lower probability of application than men (An 2010). This finding is consistent with research on access to historically male-dominated fields, including STEM majors and careers, which has found that women pursue these fields at lower rates than men (e.g., Espinosa 2011; Riegle-Crumb and King 2010).

Gender-Sensitive Admissions

An's (2010) findings about a male advantage in selective college application differ from popular media reports and two small-scale studies that indicate applicant pools in selective colleges and universities are increasingly *female*-dominated. These studies suggest gender imbalance in the pool lead admissions offices to practice gender-sensitive admissions favoring males, or what some have described as "male affirmative action" (Baum and

Goodstein 2005; Conger and Dickson 2011; Lewin 2006; Whitmire 2009). Baum and Goodstein (2005) analyses of 13 liberal arts colleges found that male applicants have a higher probability of enrollment than women when an applicant pool is more than 53 % female, suggesting admissions offices soften their standards for male academic achievement to avoid a female-dominated student body. Conger and Dickson (2011) focused on Texas colleges and universities, finding that when a higher proportion of women are admitted under the state's Top 10 % Plan, men who are not automatically admitted under the policy have a higher probability of admission than women with similar academic profiles. This finding could not be tested on a national scale because it is based on a specific state policy. However, it corroborates Baum and Goodstein (2005) finding that gender-sensitive admissions occurs in some institutional contexts, and that it relates directly to the ratio of qualified men and women in the applicant pool.

To summarize, research to date implies that female underrepresentation in most-competitive institutions may be caused by earlier gender disparities in (a) pre-college academic achievement, (b) the applicant pool, and/or (c) through gender-sensitive admissions that favors men. However, few of these studies employ a nationally-representative sample and/or consider trends across time, producing some apparently contradictory findings. Moreover, prior research has not used a competing hypotheses framework to test the efficacy of alternative explanations. Our comprehensive analysis may yield clarity by considering the evidence for multiple explanations, and by considering enrollment patterns across multiple cohorts of a nationally-generalizable sample. The conceptual framework we describe in the following section motivates three plausible hypotheses.

Conceptual Framework and Hypotheses

Under a broad conceptualization of college enrollment as the result of a *matching process* between the student and institution, this section develops propositions and hypotheses to test plausible explanations for the gender gap in most-competitive institutions. Specifically, we argue that high-achieving students are matched to elite institutions because high-achieving students want to enroll in the most elite institutions and the most elite institutions want to enroll the most high-achieving students.

Proposition 1: Elite Colleges and Universities Value Observable Admissions Criteria That Privilege Men

Hoxby (2009) provides an historical analysis of the emergence of matching between student and institutional characteristics. The American higher education system began as a collection of local autarkies; college recruited locally and most students attended the "college down the road." A nationally-integrated higher education market developed with declines in transportation and information costs. For students considering colleges, the emergence of college guidebooks (e.g., *Barron's Profiles of American Colleges*) allowed prospective students to compare the quality of geographically distant colleges, and declining airfare prices decreased the costs of attending schools far from home. Meanwhile, for colleges considering students, growth of standardized college entrance exams (i.e., SAT, ACT) appeared to increase the quality of information about students because colleges could compare geographically distant applicants, whose high school curricula were incommensurable. Entrance exams also decreased the cost of acquiring information about applicants because colleges could quickly compare applicants on the basis of a single test score, instead of reading time-consuming application essays. The cumulative effect of declining transportation costs and increased information about student quality and institution quality was that students with the highest academic profile increasingly matched to institutions with the highest academic profile regardless of geographic proximity (Hoxby 2009).

Winston's (1999) conceptual model provides additional insights about the relationship between selectivity and rankings systems in determining how students are matched to institutions. Winston (1999) described higher education as an industry in which the reputation of producers (i.e., universities) vis-à-vis potential customers (i.e., applicants) depends largely on the characteristics of their current customers (i.e., enrolled students). Therefore, universities have an incentive to be selective about who is allowed to be a customer, becoming elite by enrolling students with the highest pre-collegiate academic achievement.

In turn, ranking systems, especially *US News and World Report* (USNWR), influence which pre-collegiate academic characteristics institutions use to appraise prospective students and which characteristics prospective students use to appraise institutions. In 2010, "student selectivity" represented 15 % of the overall USNWR academic quality score, and SAT/ACT scores represented 50 % of the student selectivity score (USNWR 2010). Moving up in USNWR rankings results in somewhat more applications, higher yield rates, and an increase in mean freshman SAT/ACT scores (Alter and Reback 2014; Bowman and Bastedo 2009). Even stronger than the small increases in these indicators is the perception among administrators that rankings are crucial (Espeland and Sauder 2007). Therefore, it should come as no surprise that the increasing influence of SAT/ACT scores on admissions decisions at selective institutions would coincide with the growing influence of USNWR rankings in the public imagination.

The preceding conceptual argument suggests that institutional efforts to match on pre-collegiate academic achievement measures—in particular SAT/ACT scores—could explain men's consistent enrollment advantage in elite institutions, if men perform better than women on these criteria. Data from the College Board indicates that men's significant advantage in SAT math scores explains their persistent advantage in combined SAT math and reading test scores. Men's mean scores have been higher by 30–35 points every single year since 1972, and women earned only 37.25 % of the SAT math scores in the 700–800 point range (College Board 2012). Men outnumbered women in every ten-point increment above a score of 570 on the math portion of the SAT and, at the top of the distribution, there were two boys for every one girl with a perfect or near perfect score.

However, national evidence suggests that women outperform men in other measures of pre-collegiate academic achievement. Cho (2007) found that women's advantage in overall college enrollment emerged over the last 30 years due to their larger increases in high school performance. Girls were *over*represented in AP/Honors math, science and English courses (54, 55, and 61 % respectively), and comprised 55 % of the students in the top 10 % of their high school classes (College Board 2012). However, the criteria on which women have had an advantage—high school GPA, most importantly—seemed to have a weaker influence on the odds of selective college enrollment than did test scores, on which men have had an advantage since the 1960s (Hedges and Nowell 1995). Persell et al. (1992) thus proposed, "the pathways to selective colleges are not gender neutral" (p. 219). Given these performance statistics and the importance of high SAT scores to elite college admission, we hypothesize:

$\mathbf{H_{1a}}$ Men's enrollment advantage in most-competitive institutions is explained by men's stronger performance in admissions criteria that such institutions value.

$\mathbf{H_{1b}}$ In particular, men's enrollment advantage in most-competitive institutions is explained by men's higher SAT/ACT scores.

Proposition 2: Organizational Preferences for Men are Embedded in the Admissions Process

Admissions offices may also have explicit preferences for male applicants. This idea draws from two literatures. First, recent research on selective admissions portrays admissions offices crafting their classes of incoming students on the basis of both institution-level and individual-level characteristics (Stevens 2007). For example, in addition to valuing applicants who strengthen the institution's academic profile or who are likely to academically succeed, selective institutions also value applicants whose enrollment supports such organizational goals as diversity and financial viability (Bastedo 2014; Grodsky 2007; Karabel 2005). Colleges and universities thus weigh the demographic composition of their incoming cohort.

As discussed in the literature review, Baum and Goodstein (2005) proposed that what looks like preferences for men begins with assessments of the applicant pool. Once an applicant pool was more than 53 % female, decision makers appeared to evaluate men and women differently to prevent a female advantage in the enrolled cohort. As a result, in applicant pools where women predominated, men with lower levels of academic performance nonetheless had higher predicted probabilities of admission than women (Baum and Goodstein 2005). Paradoxically, they concluded, efforts to maintain gender balance can perpetuate a male advantage as enrollment managers overcompensate for imbalance in the pool.

Second, we should not overlook the possibility of overt discrimination against women and/or traditionally female qualities in elite institutions, whose culture still reflects the effects of being historically male. Although women have made important gains in education, sexual discrimination still exists in the workforce and in evaluation for other elite educational and professional opportunities (Gaucher et al. 2011; Madera et al. 2009; Rudman et al. 2012); therefore, it is not unreasonable to suggest that sexual discrimination may affect the admissions process at elite institutions.

An important scholarly literature has investigated the extent to which wage differences between men and women and between underrepresented minorities and Whites are due to discrimination or due to differences in human capital accumulation (e.g., education, occupation choice, years of experience) (e.g., Blau and Kahn 2006; Blinder 1973; Oaxaca 1973). In particular, Blinder and Oaxaca's individual and collective work argues that the proportion of a gender gap that cannot be explained by observable factors are due to discrimination. Applying this logic to the current research, if the male enrollment advantage in most-competitive admissions cannot be explained by male performance in academic admissions criteria or by males being more likely to apply to most-competitive institutions, then the explanation that remains is that most-competitive institutions practice gender-sensitive admissions practices that favor men.

H_2 The gender gap in the most competitive institutions is not fully explained by observable differences between men and women, suggesting institutions are employing gender-sensitive admissions practices that favor men.

Proposition 3: Women Apply to the Most Competitive Institutions at Lower Rates Than Men

Finally, another plausible explanation for the male enrollment advantage in most-competitive institutions, which also builds on the idea of matching, stresses student preferences for institutions rather than institutional preferences for students. According to this explanation, the male enrollment advantage in most-competitive institutions is not due to fewer women meeting the academic achievement criteria required by most-competitive institutions. Rather, women meet the academic achievement criteria required by most-competitive institutions, but are less likely to apply to most-competitive institutions than men meeting these criteria. This idea suggests that women are more likely than men to "under-match"—that is, to apply to and enroll in less selective institutions than their academic profiles merit (Bastedo and Flaster 2014).

One reason women may be deterred from most-competitive institutions is perceptions of the climate and/or culture. Hall and Sandler (1984) introduced findings about a "chilly climate" for women in postsecondary STEM courses, and extended their analyses to consider other aspects of elite campus environments. Deterrence from historically male educational and professional contexts is a process that begins before students enroll in college, however. For example, while earning comparable scores in eighth and tenth grade, many women lose confidence in their abilities and interest in math (Barnett 2004; Catsambis 1994). Regardless of their ability, women also may perceive the sex ratio in college majors and professions as indicative of the gender representation of the skills germane for success (Correll 2001). Internalizing performance expectations that men are innately more capable in fields with low female representation, women are less likely to form career aspirations in them (Correll 2004).

Indeed, internationally, women have been most underrepresented in traditionally male fields like engineering and agriculture since 1965, and most overrepresented in traditionally female fields like education (Bradley 2000). As Jacobs (1996) suggested, disproportionate self-selection out of STEM fields and into so-called "pink collar" fields may thus also explain why academically-qualified women under-enroll in the most competitive institutions, which award more baccalaureate degrees in STEM-related fields (see Fig. 1).[1] In summary, residual influences of past exclusion contribute to women's lower interest and self-efficacy in academic settings once dominated by men. We therefore hypothesize that:

H_{3a} Women apply to most-competitive institutions at lower rates than men.

H_{3b} Women apply at lower rates than men to most-competitive institutions that offer higher proportions of baccalaureate degrees in STEM fields.

Methodology

Data

Our sample consisted of a nationally representative set of high school completers from the 1972, 1982, 1992, and 2004 high school senior classes, utilizing data from the National Longitudinal Survey 1972 (NLS), High School and Beyond 1980 (HS&B) (sophomore cohort), National Educational Longitudinal Survey 1988 (NELS), and Educational Longitudinal Survey 2002 (ELS). We included students who completed high school within 1.5 years of their expected graduation, as the most recent wave of ELS data interviewed students 1.5 years after their expected high school graduation date, resulting in a final

[1] Findings from engineering show that academic success within educational and work climates that women perceive as accepting can compensate for technical insecurities that women may feel (McIlwee and Robinson 1992). Strengthened self-efficacy can interrupt the cycle that leads to diminished interest in fields where women are already underrepresented.

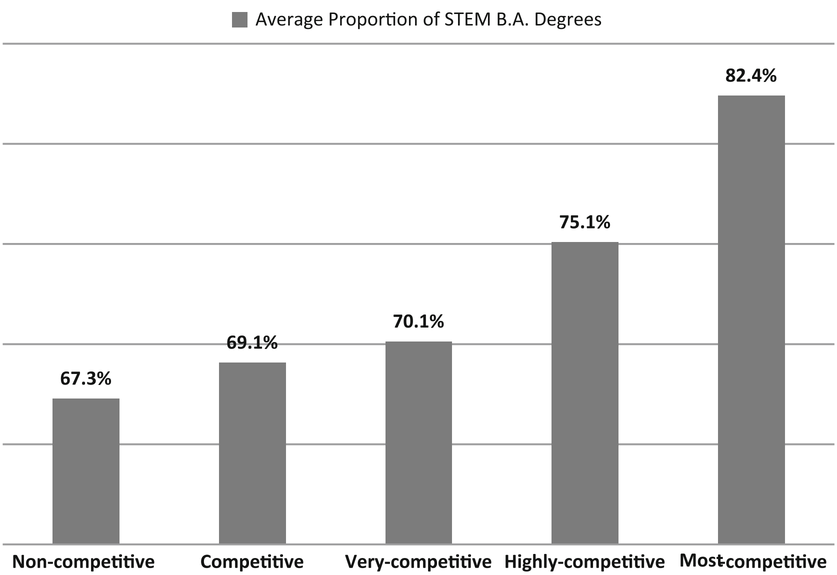

Fig. 1 Average proportion of baccalaureate degrees conferred in STEM fields, by selectivity

unweighted sample of 64,510 students, 1,800 of whom enrolled in a most-competitive institution (see Table 1 for demographic characteristics). Variables in the full sample were coded to be consistent across all four surveys. Finally we used a consistent weight variable set to non-zero values for students who responded to surveys in 12th grade and 2 years later, allowing for inferences to be made about the general population of high school completers.

The ELS2002 survey data provide more nuanced information about students' postsecondary applications than the other datasets, so a second dataset was constructed from ELS2002 for hypotheses relating to student application behavior (H_3). The unit of analysis for this dataset was the student application (overall $n = 31{,}770$, most-competitive $n = 2{,}610$), as each student could have reported from 0 to any number of total postsecondary applications.

Dependent Variables

To test hypotheses related to enrollment (H_1 and H_2) we constructed a seven-category outcome variable consisting of students' first postsecondary institution attended matched with selectivity data from *Barron's Profiles of American Colleges*. The categories were: (1) does not attend postsecondary education; (2) 2-year or a less than 2-year institution; (3) non-competitive 4-year; (4) competitive; (5) very-competitive; (6) highly-competitive and (7) most-competitive. To maintain a consistent status order across datasets, the dependent variable applied 2003 *Barron's* rankings to all years.

Similarly, to analyze application to institutions of varying selectivity (H_3), *Barron's* selectivity categories were matched with institution to which a student had applied in the ELS student-application dataset. The coding of this variable mirrors the seven-category enrollment variable discussed above with the exception of the "1" value of the variable, which was not included.

Table 1 Descriptive characteristics of sample

	Mean	SD	Minimum	Maximum
Academic preparation variables				
Highest science course[†]	3.88	1.32	1	6
Highest science course (including AP)[†]	4.16	1.62	1	8
Highest mathematics course[†]	3.46	1.54	1	6
Highest mathematics course (including AP)[†]	4.31	1.90	1	8
High school GPA	2.75	0.67	0.00	4.00
SAT score (or converted ACT score)	1,013.75	198.25	400	1,600

	Proportion (%)	Number
Co-curricular participation variables (% participation)		
Student government	16.92	10,240
Journalism	20.13	12,200
Honor society	21.29	12,900
Athletics	47.04	28,800
Vocational club	18.56	11,270
Academic club	24.81	15,040
Leader on any club, team, or organization	29.29	14,010
Demographic variables (% of total sample)		
Gender (female)	51.60	33,290
Black or African American	12.09	7,800
Hispanic	10.98	7,080
Asian or Pacific Islander	6.39	4,120
Native American	1.25	810
Mixed or other race	2.23	1,440
Socioeconomic status quartile 1	25.27	15,450
Socioeconomic status quartile 2	23.54	14,400
Socioeconomic status quartile 3	24.10	14,740
Socioeconomic status quartile 4	26.91	16,460
High school level variables (% of total sample)		
Public	81.44	52,030
Catholic	12.56	8,030
Other private	6.00	3,830
Rural	22.50	10,720
Urban	29.48	14,040
Suburban	48.01	22,870

[†] Units are one additional class in a course sequence (Dalton et al. 2007) with number of AP courses (i.e. "1" or "2 or more") included in the AP scales

Independent Variables of Interest

Hypotheses 1 and 2 required that we evaluate the importance of student characteristics related to enrollment in a most-competitive institution, especially student preparation. Previous research has shown that standardized test scores (Alon 2009; Bastedo and Jaquette 2011;

Posselt et al. 2012), high school GPA, and high school course-taking (Hawkings and Lautz 2005) all play a role in determining postsecondary admissions and enrollment. Therefore, we developed a set of pre-collegiate academic preparation variables that included SAT/ACT score, high school GPA, highest math course passed, and highest science course passed.

We constructed the SAT/ACT score variable by (1) determining composite SAT and ACT scores, (2) re-centering ACT test scores for HS&B and SAT scores for HS&B and NELS to reflect modifications to the ACT in 1989 and the SAT in 1995, (3) converting ACT scores to SAT scores with standardized concordance tables, and (4) selecting the higher composite score if students took both the SAT and the ACT. Of the students who indicated taking the SAT and/or ACT, test scores were missing for 3.3 % in NLS, 38.7 % in HS&B, 23.9 % in NELS, and 10 % in ELS. We imputed missing SAT/ACT test scores for students who indicate taking the SAT/ACT, using the average of the math and reading components from the standardized senior year test taken by all NCES survey respondents [See Posselt et al. (2012) for further detail on imputations].

The variables we created for high school GPA, highest math course passed, and highest science course passed utilized raw, course-level high school transcript data not available for NLS. Given the centrality of academic preparation to our research questions, we therefore developed two sets of multivariate models, one including only those variables available in the 1972 cohort and one including all variables of interest.

Math and science course-taking were defined using measures developed by Burkam et al. (2003) and used by Dalton et al. (2007). Highest math course taken was defined as follows: 1 = No math or ''low'' math; 2 = Algebra 1 or plane geometry; 3 = Algebra 2; 4 = Algebra 3, trigonometry, or analytic geometry; 5 = Pre-calculus; and 6 = Calculus. Highest science course taken is defined as follows: 1 = No science or ''low'' science; 2 = Basic biology or secondary physical science; 3 = General biology; 4 = Chemistry 1 or Physics 1; 5 = Chemistry 1 and Physics 1; 6 = Chemistry 2, Physics 2, or advanced biology. Additional course-taking variables were created including AP courses for the 1992 and 2004 cohorts, where data on AP course-taking was available. Highest math course taken, including AP, was extended to include the code 7 = AP Calculus. Highest science course taken, including AP, added the following codes: 7 = 1 AP science course, 8 = 2 AP science courses, 9 = 3 or more AP science courses.

To examine the role of extracurricular involvement and leadership (Gabler and Kaufman 2006), models also included self-reported measures of participation in key extracurricular activities (student government, honors society, athletics, vocational club, academic club). For NLS, NELS, and ELS, a self-reported, dichotomous variable of whether the student had been a leader in any extracurricular activities was also available and included in the models.

For the analyses of ELS data pertaining to gendered selection into most-competitive institutions by program offerings (H_{3b}), we created variables using the Integrated Postsecondary Education Data System. For this portion of the analysis, we focused specifically on STEM concentration at most competitive institutions, as previous research has shown that women are less likely to pursue STEM programs than men (Espinosa 2011; Riegle-Crumb and King 2010). The institutional program offering variables assessed the proportion of baccalaureate degrees conferred at most-competitive institutions in a STEM field. First, STEM fields were defined according to the list maintained by the Department of Homeland Security, last updated in 2012 (Department of Homeland Security 2013). Then, the number of STEM baccalaureate degrees conferred by each institution in 2003 was divided by the total number of baccalaureate degrees conferred. Finally, most-competitive institutions were separated into three equally-sized groups based on the proportion of STEM degrees conferred: Low STEM, Moderate STEM, and High STEM. If women were enrolling in most-competitive institutions at lower rates than males due to the disproportionate concentration of STEM programs at such institutions (H_{3b}), then it would also be expected that women would apply at lower rates to High STEM institutions than Low STEM institutions when they did apply to most-competitive institutions.

Covariates

In order for the unexplained component of a decomposition analysis to relate to discrimination (H_2), the model must be well specified (i.e., composed of independent variables of importance and also an appropriate set of controls). Demographic, socioeconomic, and academic preparation covariates were included in all multivariate analyses as controls, as enrollment in most-competitive institutions was understood to vary across each of these variables. Race was coded using dichotomous variables for Black or African American, Hispanic, Asian or Pacific Islander, Native American, and Mixed or Other race, using White as the excluded reference group. Socioeconomic status was divided into even quartiles for each cohort and coded as dichotomous variables, using the lowest quartile for each cohort as the excluded comparison group. Dummy variables for Catholic private high school of origin and other private high school of origin were included, leaving public high schools as the reference group. Finally, dummy variables for urban and rural high schools were included, leaving suburban high schools as the comparison group. Table 1 shows a complete list of covariates and descriptive statistics relating to those variables.

Methodology

Decomposition Analysis

We examined the enrollment gap between men and women across all four cohorts using non-linear decomposition techniques based upon those developed by Blinder (1973) and Oaxaca (1973). Like Blinder–Oaxaca decomposition, differences in the probability of enrollment were decomposed into explained variation (i.e., differences due to covariate values) and unexplained variation (i.e., differences in predicted enrollment when covariate values are assumed equal across gender). Explained variation simply related differences in student profiles (e.g. academic preparation, background characteristics, etc.) to the selectivity of institution in which they enrolled (H_{1a}). In well-specified models, Blinder (1973) and Oaxaca (1973) argued unexplained variation is due to discrimination (H_2), because in a non-discriminating world, individuals with equal characteristics should have the same outcome regardless of gender. To ensure that the model was well specified for access to elite postsecondary institutions, we included in the decomposition models a full set of covariates related to admission to selective institutions.

The traditional Blinder–Oaxaca approach decomposes the estimated “gap” in the dependent variable between two groups (here A and B) into explained and unexplained variation using the following OLS regression equation:

$$\bar{Y}_A - \bar{Y}_B = (\bar{X}_A - \bar{X}_B)\hat{\beta}_A + \bar{X}_B(\hat{\beta}_A - \hat{\beta}_B)$$

where $\bar{Y}$ represents the mean value of the dependent variable for a group (A or B), $\bar{X}$ represents the mean value of the set of independent variables for a group, and $\hat{\beta}$ represents the set of estimated coefficients from the OLS regression of Y on the Xs. The left-hand side of the equation represents the gap, or difference between the means of groups A and B on the dependent variable. This gap is decomposed into two parts on the right-hand side of the equation. The first portion on the right hand side of the equation represents the explained variation (i.e., the difference in the outcome due to differences in independent variable values, $\bar{X}_A$ and $\bar{X}_B$). Variable values between groups in this portion of the equation are allowed to differ, but coefficient values are held constant. The second portion represents the difference in the outcome that is due to differences in the estimated coefficients, $\hat{\beta}_A$ and $\hat{\beta}_B$. Here, variable values are held constant, but coefficients are allowed to differ between the groups.

However, this linear model is inappropriate in cases where the dependent variable is non-continuous (Sinning et al. 2008). In such cases, the conditional expectation of Y, $E(Y_i|X_i)$, is likely to differ from $\bar{X}_G\hat{\beta}_G$, which would be appropriate in an OLS model. In the last twenty years, higher education researchers have shifted away from linear regression when predicting dichotomous and categorical outcomes such as college enrollment and institutional selectivity (Dey and Astin 1993; Cabrera 1994; Peng et al. 2002).

Our dependent variable of interest, enrollment in a most-competitive institution, was dichotomous; therefore, we estimated two non-linear models which (1) decomposed the enrollment gap by gender and (2) estimated coefficients for each independent variable to indicate their contribution to the explained portion of the gap. The first was Stata's *nldecompose* command (Sinning et al. 2008), which used the conditional expectations mentioned above to account for the non-linearity in the model. The decomposition was calculated as follows:

$$\Delta_A^{NL} = \left\{E_{\hat{\beta}_A}(Y_{iA}|X_{iA}) - E_{\hat{\beta}_A}(Y_{iB}|X_{iB})\right\} + \{E_{\hat{\beta}_A}(Y_{iB}|X_{iB}) - E_{\hat{\beta}_B}(Y_{iB}|X_{iB})\}$$

Here, the leftmost bracketed portion on the right-hand side represents the explained variation—in our analysis, the difference in enrollment due to differences in covariate values. The rightmost bracketed portion represents unexplained variation, or enrollment differences due to differing coefficient values. And like the Blinder–Oaxaca approach, the left bracketed portion holds coefficients constant while allowing variable values to differ, while the right portion holds variable values constant and allows coefficients to differ. However, now the differences are not taken between the mean values of the independent variables and the estimated coefficients. Instead they are taken between the conditional expected values of the dependent variables, Y_{iG}, calculated using the independent variable values, X_{iG}, and estimated coefficients of each group, $\hat{\beta}_G$. This model allowed us to address H_2 by providing a test for the significance of the explained and unexplained portions of the difference in the dependent variable. We also used bootstrapping to produce robust standard errors. However, this model did not provide coefficients specific to each independent variable to indicate their contribution to the explained portion of the gap.

In order to obtain such coefficients, which we required to test H_{1b}, we relied on the use of Stata's *fairlie* command (Fairlie 2005), which provided a non-linear decomposition framework particularly intended for binary outcome variables. The decomposition was calculated as follows:

$$\bar{Y}_A - \bar{Y}_B = \left[\sum_{i=1}^{N_A}\frac{F\left(X_{iA}\hat{\beta}_A\right)}{N_A} - \sum_{i=1}^{N_B}\frac{F\left(X_{iB}\hat{\beta}_A\right)}{N_B}\right] + \left[\sum_{i=1}^{N_B}\frac{F\left(X_{iB}\hat{\beta}_A\right)}{N_B} - \sum_{i=1}^{N_B}\frac{F\left(X_{iB}\hat{\beta}_B\right)}{N_B}\right]$$

Here, N_G represents the sample size for group G; therefore each sigma notated section calculates an average value for all observations within that group. The difference between the average probabilities of the dependent variables in the groups (i.e., $\bar{Y}_A$and $\bar{Y}_B$)—in our analysis, the difference in the average probability of enrollment between men and women—was decomposed into variation based on measured covariate value differences, enclosed in the left brackets, and variation based on coefficient differences, in the right brackets. In this model, F represents the cumulative distribution function of the logistic distribution:

$$\frac{1}{1+e^{\frac{-(X-\mu)}{\sigma}}}$$

Therefore, the model was not as generalizable as *nldecompose*, which was able to work with a range of conditional expected values, but for our purposes the use of logistic regression fit the data. The decomposition procedure for the *fairlie* program operates by iteratively generating simulated samples of the data that pair observations from each group and estimating predicted differences between those samples.[2] The average contribution of each variable to the estimated gap from all of the iterated samples is reported as the output.

Multinomial Logistic Regression

Finally, we evaluated gendered self-selection into most selective institutions (H_3) by employing multinomial logistic regression (MNL). The ordered nature of the institutional selectivity categories used to code enrollment and application suggest the use of ordinal logistic regression, but violation of the parallel regression assumption (Long and Freese 2005) compelled the use of MNL. By treating the outcome categories as fully categorical, rather than ordered, MNL does not assume that coefficients for each independent variable will be constant (i.e., slopes will be parallel) across the regression equations corresponding to each outcome category.

Two MNL models were used to estimate each portion of H_3, with application to non-selective 4-year institutions used in both cases as the baseline comparison outcome category. To test generally for gender differences in application to institutions based on selectivity (H_{3a}), the categorical application variable was regressed on academic preparation, co-curricular participation, demographic characteristics, and high school context. Next, to test gender differences in application based on institutional STEM degree offerings (H_{3b}), we added a set of variables related to low, moderate, and high degree offerings in STEM fields. The structure of the data resulted in multiple applications per student. Anticipating that student applications (the unit of analysis) are therefore more highly related within students than in the national population, the MNL models account for clustering by estimating robust standard errors.

Limitations

The first limitations of our analysis stemmed from the complications of creating a single analysis dataset from four surveys. Although we gave great attention to developing variables with consistent coding schemes across each of the cohorts, it is difficult to ensure that a student's response to an item concerning their academic profile in 1972 is equivalent to the response of a student to a similar item in 2004.

[2] In our analyses, 100 paired samples were used to produce each set of *fairlie* decomposition estimates.

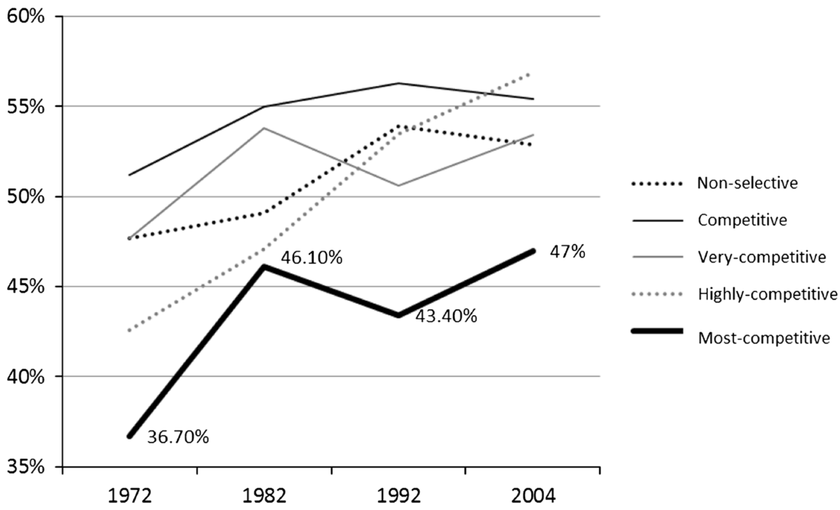

Fig. 2 Proportion of female enrollment in 4-year colleges and universities, across *Barron's* selectivity categories (Source: NLS, HS&B, NELS, ELS)

Another limitation was reliance on students' enrollment behaviors as a proxy for both students' preferences for institutions and institutions' preferences for students. Ideally, data on application, admission, and enrollment could have been combined to analyze student preferences, but no such data was available beyond the 2004 cohort, limiting the possibility of longitudinal analyses. Nevertheless, the approach we employed had strong precedent in the empirical literature (e.g., Grodsky 2007; Torche 2011).

Finally, some may consider the coding of institutional selectivity for our longitudinal analyses a limitation. One advantage of the Barron's criteria is that they are well defined across levels of selectivity and have changed little since 1972 (Bastedo and Jaquette 2011). This stability allowed us to apply *Barron's* (2003) rankings to all years and thus make cross-cohort comparisons, an approach used in previous longitudinal research on selective college access (e.g., Astin and Oseguera 2004). However, fixing the 2003 rankings meant that a small proportion of institutions were counted as more selective in 1972, 1982, or 1992 than they may have been.

Results

The problem of women's under representation in the most competitive institutions is evident in Fig. 2, which displays the proportion of women enrolled in colleges and universities of varying levels of admissions competitiveness across four cohorts. Unlike every other institutional category, women remain less than 50 % of the students enrolled in the most competitive institutions. In the results that follow, we examine the evidentiary basis for three possible explanations of this trend.

Reliance on SAT Scores in Admissions Creates De Facto Preferences for Men

We find strong evidence for Hypothesis 1, that admissions offices' reliance on SAT scores explains the gender enrollment gap in most-competitive institutions. Table 2 provides

Table 2 Testing H_{1a}: T-tests of differences in academic preparation in *Barron's* highly and most competitive institutions, by gender and cohort

		Men	Women
SAT score (points on SAT scale)	1972		
	1982	1,255	1,233
	1992	1,271	1,249**
	2004	1,350	1,324*
Highest math course†	1972		
	1982	4.62	4.69
	1992	5.24	5.16
	2004	5.68	5.7
Highest math course (including AP)†	1972		
	1982		
	1992	6.52	6.63
	2004	7.31	7.33
Highest science course†	1972		
	1982	4.84	4.71
	1992	5.16	5.17
	2004	5.41	5.19
Highest science course (including AP)†	1972		
	1982	5.16	5.24
	1992	5.36	5.29
	2004	6.43	6.40
GPA (4.00 scale)	1972		
	1982	3.29	3.43**
	1992	3.35	3.35
	2004	3.57	3.63***

† Units are one additional class in a course sequence (Dalton et al. 2007) with number of AP courses (i.e. "1" or "2 or more") included in the AP scales

* $p < 0.1$; ** $p < 0.05$; *** $p < 0.01$

descriptive statistics about differences by gender over time on academic preparation metrics in most-competitive institutions (H_{1a}). These bivariate analyses of measures that admissions offices commonly consider lay a foundation for the multivariate analyses. Men had an advantage on a majority of the metrics of academic preparation except GPA, although course-taking differences are non-significant and SAT differences are only significant in 1992 and 2004. The average male SAT score was between 15 and 40 points higher than the average female score, while the average female GPA was 0.14 points higher in the 1982 cohort and 0.06 points higher in the 2004 cohort than the average male GPA.

Results of the non-linear decomposition analyses testing H_1 and H_2 are presented in Table 3. We conducted two sets of analyses. The first model, considered our baseline, uses only demographic controls to predict the enrollment gap in most-competitive institutions. The second model adds academic preparation and high school related variables that are expected to contribute to the enrollment gap.[3] The top three rows present results from the significance test for the estimated gap in enrollment between men and women, as well as bootstrapped estimates of the significance of the explained and unexplained portions of that gap. The "Unexplained" row indicates the portion of the gap that is due to differences in coefficient values between men and women; this is the portion of the gap that may be due to gender discrimination.

As displayed in the top of Table 3, comparing the baseline and full models from the non-linear decomposition reveals that accounting for academic preparation (a) reduces the unexplained gender enrollment variance and (b) increases the explained gender enrollment variance in each of the four cohorts. The specific admissions criteria that influence the gap and to what degree they do so are then clarified in the lower portion of Table 3, where we report individual contributions of each variable to the explained portion of the gender gap. Here, we are most interested in the factors with negative coefficient estimates, which provide evidence of men's continued enrollment advantage in most-competitive institutions.

The most consistent predictor of men's enrollment advantage is SAT score, which increases in importance over time as both a predictor of enrollment and as an explanation of the gender gap. In fact, SAT score is the only variable that is statistically significant across all four cohorts. In each model, the coefficient associated with each variable can be interpreted as the expected shift in the enrollment gap as that variable varies, when holding all other variables constant.[4] For example, in 1972, the coefficient associated with SAT suggests that the gender gap on average SAT scores (approx. 17 points, see Table 2) accounts for a 4.2 percentage point enrollment advantage for males, or about 63 % of the total 1972 enrollment gap. In 2004, there is a 4.6 percentage point enrollment gap, which SAT scores fully explain (see Footnote 6). Coefficients associated with SAT scores remain relatively consistent; however, because the size of the estimated enrollment gap varies, we can conclude that the contribution of SAT score to the gender enrollment gap also changes over time. In summary, differences in average SAT scores between males and females are the largest contributor to each of the estimated gender gaps.

Other academic preparation variables that contribute to the male advantage include highest science (1992) and mathematics (2004) course taken and involvement in a vocational club (1972) or athletics (2004). The only academic preparation variable that significantly benefits women is involvement in an honor society (1972), which reduces the gender gap for females by about 16 percentage points.[5] However, this marginal effect was insufficient to offset men's overall enrollment advantage that year. Taken together, these findings provide strong support for H_{1b}, that men's enrollment advantage in most competitive institutions is due to their higher performance on standardized test scores.

[3] Because high school GPA and course enrollment data were not included in the NLS data, those variables are not included in the full model for that cohort.

[4] All other variables are held constant for the estimation of each of these coefficients; therefore, the estimated contributions to the gap may be larger than the gap itself.

[5] Such "reductions" can however be deceiving, as the overall gender gap still advantages males in the end. Therefore, we can interpret these reductions as a constraint on the actual gender gap, which would be about 6.8 % had women not participated in honors societies at a higher rate than males.

Table 3 Testing H_1 and H_2: decomposing gender enrollment gap in *Barron's* most selective institutions, by cohort

	1972		1982		1992		2004	
	Baseline	Full	Baseline	Full	Baseline	Full	Baseline	Full
NLDECOMPOSE								
Estimated gap	0.06**	0.07**	0.02	0.01	0.08†	0.08†	0.03	0.04*
Explained	0.02*	0.04	0.00	0.01	0.03	0.10*	0.02*	0.04*
Unexplained	0.04*	0.03	0.02	0.00	0.05	−0.02	0.01	0.00
FAIRLIE								
Academic preparation								
SAT score	–	−0.04***	–	−0.03*	–	−0.04***	–	−0.05***
High school GPA	–	–	–	0.01	–	0.00	–	0.00
Highest science course	–	–	–	0.00	–	−0.01†	–	0.00
Highest mathematics course	–	–	–	0.00	–	0.00	–	−0.01**
Co-curricular participation								
Student government	–	0.00	–	0.01	–	0.00	–	0.00
Journalism	–	0.00	–	0.00	–	0.00	–	0.00
Honor society	–	0.01*	–	0.00	–	0.00	–	0.00
Athletics	–	−0.01	–	0.00	–	−0.01	–	−0.01*
Vocational club	–	−0.01†	–	−0.01	–	0.00	–	0.00
Academic club	–	0.00	–	0.00	–	0.00	–	0.00
Leader on any club, team, or organization	–	0.00	–	–	–	0.01	–	0.00
Demographics								
Black or African American	0.00	0.01*	0.00	0.01	−0.01	0.01	0.00*	0.00
Hispanic	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01***
Asian or Pacific Islander	0.00***	0.00	0.00	0.00	0.00	0.00	0.00**	0.00
Native American	–	–	–	–	0.00	0.00	0.00	0.00
Mixed or other race	–	–	–	–	–	–	0.00	0.00
SES quartile 2	0.00	−0.01	0.00	0.00	−0.01	0.00	0.00	0.00
SES quartile 3	0.00	−0.01	−0.01	0.00	0.00	0.00	0.00	0.00
SES quartile 4	−0.02***	0.01	0.00	0.00	−0.03*	−0.01	−0.03***	0.00
High school characteristics								
Other private	0.01*	0.01***	0.00	0.00	0.00	0.00	0.00†	0.00
Catholic	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Urban	–		−0.01	−0.01	−0.01	0.00	0.00	0.00

Table 3 continued

	1972		1982		1992		2004	
	Baseline	Full	Baseline	Full	Baseline	Full	Baseline	Full
Rural	–		0.01*	0.00	0.02**	0.01*	0.00	0.00
N	1,260	480	1,210	670	1,500	1,060	1,910	1,510

No Evidence for Overt Preferences for Men

The third row of Table 3 summarizes findings for H_2. The only analysis in which we identified significant unexplained variation—the first criterion for detecting discrimination using this method—was the baseline model estimated for the 1972 cohort. However, any potential discrimination suggested by this baseline model disappeared when we accounted for academic preparation in the full model. In summary, the evidence does not support H_2, suggesting gender-sensitive admissions preferences is not producing the male enrollment advantage in elite institutions.

No Evidence for Women Opting Out at the Application Stage

To discern whether the gender gap in enrollment in most-competitive institutions is simply due to differences in where men and women apply, we analyzed the detailed data available about the institutions to which students in the 2004 high school cohort applied. Results from models estimating differences in application behavior by gender (H_3), are presented in Table 4. All results in this table are presented as marginal effects for ease of interpretation. Each effect represents the average change in the probability of applying to a most-competitive institution associated with a categorical (for dichotomous variables) or one-unit (for continuous variables) change in the corresponding independent variable.

Evidence for the opting out hypothesis would be represented by a statistically significant, negative marginal effect for the "female" variable on the application outcomes. Holding constant all other variables in the 2004 model, women's probability of applying to most-competitive colleges and universities is no different than that for men ($p = .63$). This non-significant p value does not provide evidence in support of H_{3a}, that women have a lower probability than men of applying to most competitive institutions.

Finally, the marginal effects in the "STEM Degree Offerings" column of Table 4 provide a test of H_{3b}, that women have a lower probability than men of applying to most-competitive institutions that offer higher proportions of baccalaureate degrees in STEM fields. The marginal effects of greatest interest here are associated with the program offering interaction terms: "Moderate STEM X Female" and "High STEM X Female". These interaction variables capture whether the relationship of gender and application varies by institutions' emphasis on STEM disciplines. However, neither of these effects reaches conventional levels of statistical significance, suggesting that women are no less likely than men to apply to most-competitive institutions with higher concentrations of STEM degree offerings. On the other hand, the "Moderate STEM Offerings" main effect is negative and statistically significant and the "High STEM Offerings" main effect is positive and statistically significant. All else held constant, men and women both have a 9 percentage point higher probability of applying to most-competitive institutions that offer the highest concentration of STEM baccalaureate degrees *versus* those with the fewest

Table 4 Testing H_{3a} and H_{3b}: MNL marginal effects of application to most-competitive institutions and by STEM focus

	Basic model		STEM degree offerings	
	Marginal effect	*p*	Marginal effect	*p*
Female	0.002	0.758	0.002	0.786
STEM orientation				
Moderate stem offerings	–		−0.058	0.000***
High stem offerings	–		0.094	0.000***
Moderate stem × female	–		−0.003	0.774
High stem × female	–		0.001	0.927
Academic preparation				
SAT score	0.0004	0.000***	0.000	0.000***
High school GPA	0.0301	0.000***	0.024	0.001***
Highest science course	0.0109	0.000***	0.007	0.003***
Highest mathematics course	0.0108	0.000***	0.008	0.002***
Co-curricular participation				
Student government	0.0071	0.302	0.009	0.152
Journalism	0.0130	0.043**	0.009	0.140
Honor society	0.0199	0.003***	0.024	0.000***
Athletics	0.0139	0.026**	0.016	0.005***
Vocational club	−0.0127	0.220	−0.005	0.573
Academic club	0.0158	0.008***	0.013	0.013**
Leader on any club, team, or organization	0.0133	0.040**	0.008	0.186
Demographics				
Black or African American	0.0759	0.000***	0.058	0.000***
Hispanic	0.0732	0.000***	0.056	0.000***
Asian or Pacific Islander	0.0739	0.000***	0.048	0.000***
Native American	0.0671	0.032**	0.051	0.098*
Mixed or other race	0.0505	0.000***	0.040	0.000***
SES quartile 2	−0.0289	0.026**	−0.022	0.053*
SES quartile 3	−0.0291	0.008***	−0.018	0.075*
SES quartile 4	−0.0133	0.190	−0.003	0.785
High school characteristics				
Other private	0.0115	0.069*	0.009	0.120
Catholic	−0.0177	0.142	−0.016	0.135
Urban	0.0300	0.001***	0.028	0.000***
Rural	0.0050	0.531	0.008	0.281
N	16,800		16,770	

Results reported as marginal effects should be interpreted as the estimated change in the probability of applying to a most-competitive institution due to a one unit change in the independent variable

* $p < 0.1$; ** $p < 0.05$; *** $p < 0.01$

STEM degrees conferred. Similarly, men and women both have an approximately 6 percentage point lower probability of applying to institutions with a moderate concentration of STEM offerings, versus those with the fewest STEM degrees conferred. This finding provides further, albeit indirect, support for the conclusion that women are not uniquely opting out of most-competitive institutions due a mismatch between their goals and most-competitive institutions' degree offerings.

Discussion

Our analyses suggest that the gender enrollment gap in access to the nation's most competitive institutions is not a matter of student choice, but instead an issue of admissions reliance on a criterion that privileges male applicants. Just as previous research has found that admissions is one process by which privileges of Whiteness and wealth are indirectly embedded in elite institutions (Bastedo and Jaquette 2011; Karabel 2005; Posselt et al. 2012; Stevens 2007), present admissions norms also help embed male privilege in the organizational climate for diversity (Milem et al. 2005). Men and women graduating from high school in 2004 did not have significantly different probabilities of applying to the most competitive colleges and universities, and this trend did not seem to be affected by considering the proportion of STEM degrees such institutions offer.

Neither did we find evidence for gender sensitive admissions favoring men. In three of four cohorts, unexplained variation did not account for a significant portion of the gender enrollment gap, casting doubt on the presence of overt preferences for male applicants. Apparent gender bias against women in 1972 disappears when we control for academic preparation, standardized test scores, and extracurricular involvement. So-called male affirmative action may therefore be occurring within select institutions and/or institutional types such as liberal arts colleges, as found by Baum and Goodstein (2005) and Conger and Dickson (2011), but does not seem to be a sufficiently widespread to be captured in the nationally generalizable sample of high school graduates we analyze.

Rather, the evidence best supports a conclusion that women's lower average standardized test scores, combined with the importance attributed to those scores in admissions decisions, creates de facto preferences for men that drive women's under-enrollment in these institutions. SAT score is the single most important predictor of enrollment for men and women across all four cohorts and the importance of this predictor has grown over time; therefore, women's failure to attain scores that are, on average, equivalent to men means that their enrollment rates are also not equivalent.

Implications and Conclusion

This research has implications for future scholarship on women in education and college access, as well as for college admissions practice. One implication of this work is the evidence it provides that admissions offices are not weighting application criteria differently by gender. This supports DiPrete and Buchmann's (2006) finding that we are converging on a single equation for explaining male and female college enrollment. However, broad-scale demographic analyses such as DiPrete and Buchmann's (2006) and ours may obscure details at the levels of individual institutions and majors. For example, it is possible that STEM-focused institutions and colleges do evaluate men and women differently for admissions. Qualitative analysis in such settings could therefore help uncover detail about how gender stratification is both culturally embedded and actively challenged.

Future research should consider that the overt preference for men demonstrated by institutions may not occur at the admission stage, but rather in the granting of financial aid packages. The use of aid leveraging to shape incoming classes to postsecondary institutions has taken on a prominent role in U.S. higher education (Curs and Singell 2010; DesJardins and McCall 2010; Duffy and Goldberg 1998). It may be the case that men and women are treated equitably through the admissions process at most-competitive institutions, but are offered differential packages based on gender that affect their enrollment decisions, and thus the gender enrollment gap.

Research should also address how gender equity in selective institutional enrollment intersects with other salient demographic and academic characteristics. There is some evidence that gender differences in admission may be tied to the ways in which applicants "max out" their high school curricula, as women are more likely to reach the highest courses in English and science, but not mathematics (Bastedo and Howard 2014). In addition, previous work has focused on the degree to which socioeconomic status (Astin and Oseguera 2004; Bastedo and Jaquette 2011) and race (Grodsky 2007; Posselt et al. 2012) are similarly tied to institutional selectivity in higher education. However, exploring the complex interactions among gender, SES, and race with selectivity of postsecondary institutions is likely to unearth further concerns for the equitability of the American higher education system.

We find that de facto institutional preferences for men can be traced to overreliance on high SAT scores in admissions decision making. This practice is problematic not only from the standpoint of equity and access, but also given what we know about SAT scores' predictive validity. By the College Board's (2008) own admission, SAT scores under-predict the first year GPA of women college students. Analyzing SAT sections and high school GPA separately and together, the College Board's analysis supports previous work of Ramist et al. (1994) and Bridgeman et al. (2000) to conclude that differential validity by gender is smallest for GPA and highest for all sections of the SAT. Disproportionately excluding women from institutions on the basis of a criterion that under-predicts their performance is especially difficult to justify considering, on average, women outperform men once they arrive on campus and have higher probabilities of graduating in a timely manner (Bowen and Bok 1998; Snyder and Dillow 2007).

If institutions wish to admit the students who are most likely succeed academically, then their decisions should place greater weight on high school grade point average than SAT scores (Niu and Tienda 2010). Of course, were institutions to adopt the practice of placing more weight on high school GPA, we might very well see an inversion of the gender enrollment gap given women's higher average GPA. As Persell et al. (1992) noted in their analysis of HS&B data, women's under-enrollment in selective institutions can be conceptualized as "differential asset conversion" since women's strength in high school performance is not converting to selective college admissions as effectively as men's strength in SAT scores. Given the human capital signaling functions of degrees from most-competitive institutions, they can be thought of as assets that convert to future labor market opportunities (Bourdieu and Passeron 1990; Frank and Cook 1995). From this perspective, a primary concern about men's persisting enrollment advantage in these institutions is that it may encourage longer-term disparities in workplace outcomes. For example, it may perpetuate the gender gap in corporate leadership positions, whose candidates are often drawn from such institutions (Bills 2003).

Overreliance on SAT scores can be traced both to elite institutions' efforts to maintain high average test scores to preserve their rankings, as well as to admissions file readers' subconscious judgment processes (Bastedo 2014). Each of these implies different strategies for reducing gender inequities in admissions. From an institutional stratification perspective, elite institutions' status has much to do with their high selectivity, and they therefore have a vested interest in maintaining a high level of competition for slots in their programs.

The pursuit of prestige indirectly limits access for women and other underrepresented groups by emphasizing an admissions criterion that "further privilege[s] the already advantaged" (Karabel 2005, p. 386). Magazine rankings serve as the major catalyst driving the focus on increasing standardized test scores, and the recent decision by *U.S. News* and *World Report* to increase the weight of SAT scores in their formula (U.S. News 2013) serves only to perpetuate negative impacts on gender equity. For colleges and universities unwilling to challenge the system of prestige, one strategy aimed at building diversity while maintaining high average SAT scores is micro-targeted recruitment—identifying and investing in small lists of students who match very specific desired profiles.

A radical strategy to align institutional commitments to equity and prestige would be for the colleges and universities at the very top of the rankings to use their influence to seek change in the system—even at the potential expense of their own position in the rankings. They could do so individually by joining the hundreds of colleges and universities that have made SAT scores optional for admission (http://fairtest.org, 2013). They could also act collectively to encourage USNWR to revise their rankings algorithms to place less weight on standardized test scores and encourage metrics that simultaneously predict student success and pressure institutions toward equitable opportunities for women, low-income students, and African Americans, Latinos, and Native Americans. The top institutions have sufficient institutional legitimacy that advocating as a bloc and leaning on the evidence could yield positive change in macro-level public perceptions about what qualities mark America's "best" colleges and universities.

However, SAT scores' undue importance is also a micro-level problem. As academically qualified students apply to more and more schools to maximize their enrollment choices (An 2010), enrollment competition is stiffening, and this leads those who read admissions files to seek efficient means of distinguishing applicants. Test scores, unlike the rest of the file, may seem quantified, decontextualized, and unambiguous, and thus have a disproportionate influence on the final admission decision. Interventions in admissions offices are needed to place test scores in their appropriate place in holistic admissions processes. For example, admissions offices should develop practices that address common psychological biases among admissions officers that produce preferences for students who have higher standardized test scores, despite institutional policies to interpret academic achievement in the context of family and school contexts (Bastedo 2014). And for admissions offices to accept students with weaker standardized test scores than others who have applied, there needs to be leadership from the top of the university that emphasizes the importance of student diversity and other academic and personal characteristics of students that SAT and ACT scores do not represent.

Our work demonstrates one of the many ways in which the "gender gap" has yet to be fully addressed (Sax 2007) amid a national discussion that focuses primarily on "the war against boys" (Sommers 2013). As revealed in a recent case study of efforts toward gender equity in Harvard Business School, undergraduate representation is just one aspect of cultivating gender equity and inclusion in elite postsecondary institutions (Kantor 2013). However, structural diversity conditions students' perceptions of belonging, inclusion, and a positive campus climate (Locks et al. 2004). Erasure of a durable access barrier to America's most selective colleges thus represents a critical step in the broader agenda to realize gender equity in American higher education.

Acknowledgments We acknowledge that this coding of race ignores heterogeneity within racial and ethnic groups, but it was necessary to maintain this NCES coding scheme to ensure continuity across all four cohorts in our data.

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