The College Application Gauntlet:
An Systematic Analysis of College Application Step Completion

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An Exploration of College Application Step Completion

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Few studies have looked rigorously at the succession of college application steps between the development of college aspirations and college enrollment. This study uses ELS data and employs a multivariate logistic framework to examine differences in completion of nine steps in the college application process based on academic and family background characteristics and the completion of prior steps. It also looks at steps towards enrollment at selective institutions. Few students enroll in college without completing five major steps. College aspirations and taking the SAT or ACT as well as meeting with a college counselor or representative are particularly indicative of student completion of subsequent steps. Furthermore, academic preparation is a better predictor of step completion than racial and income categories.

Introduction

Despite a wide body of literature that identifies factors associated with the development of college aspirations and enrollment decisions, few studies have looked in a large-scale, systematic way at the steps a student must take between aspiration and enrollment in order to achieve postsecondary attendance. In one of the few studies that has begun to explore these intermediate processes, Avery and Kane(2004) find that among a sample of urban high school seniors, only 36 percent of those students who had originally planned to attend a four-year college did so. For many of these students, the failure to reach a four-year university was associated with a failure to complete the application process: some students who intended to go to college made it as far as taking the SAT, but then failed to complete their applications; other students in the study, despite a stated interest in college going, did not even make it as far as taking the SAT. This evidence suggests that the process that leads from initial educational expectations to application and enrollment is regularly interrupted, especially for low income students. While Kane and Avery demonstrate the extent of this interruption in Boston, we know little about the process nationally or how students' background and educational performance predict their likelihood of making it through various steps of the postsecondary application process—how students go from intent to enrollment.

This paper uses data from the Education Longitudinal Study: 2002 (ELS) to describe the steps in the college application process and models the relationship between step completion and high school students' background characteristics. I specifically address two questions: (1) Is

there a clear progression of steps that lead to college enrollment? And (2) to what extent do students from different backgrounds complete each step toward enrollment in a four year college? In particular, I examine the relationship between step completion and race, socioeconomic status, and academic achievement. I find that there is a sequence of 5 steps that nearly all students who enroll in a four-year college complete. Students who do not complete any one of these five steps are far less likely to enroll, even though these steps are not necessarily officially mandated for college enrollment. There are marked differences in step completion by racial and socioeconomic groups; however, these differences partially disappear, or even reverse once controlling for academic achievement measures.

Background

Prior Research

There are many well-documented benefits to individuals and society of college attendance. People with a bachelor's degree earn, on average, over $20,000 more a year than people with no more than a high school diploma (Baum and Ma, 2007). Even when controlling for self-selection and ability, researchers find significant, positive returns to each year of schooling ranging from six to 15 percent (see Card 2001 for a review). Furthermore, a college degree can lead to better health practices and health care coverage, greater civic engagement, and higher rates of employment (Baum and Ma, 2007). Despite these benefits, many students who could benefit from college attendance fail to enroll. While 78 percent of students aspired to attend a four-year college, for the graduating class of 1992, only 45 percent ultimately enrolled in a four-year college or university (US Department of Education).

College aspiration and enrollment are not uniform across racial and socioeconomic groups; differences in students' intent to enroll can be seen as early as when students develop aspirations to attend college. Berkner and Chavez (1997) note that 80 percent of white students in their senior year of high school report aspiring to a four-year degree, while only 73 percent of black and 65 percent of Hispanic students share similar aspirations. Similarly, students from families earning more than $75,000 report four-year college aspirations at a rate of 89 percent versus 72 percent among students from families earning less than $25,000. These differences exist even in the midst of a trend in which it appears that college aspirations are becoming the norm, and having such aspirations is becoming increasingly independent of family background characteristics (Goyette, 2008).

Racial and family background differences are even more pronounced when it comes to actual enrollment in college. Many researchers have noted that the chances of students enrolling in college increase with students' socioeconomic status, even when controlling for test scores (see, for example Akerhielm, Berger, Hooker, and Wise 1998; Berkner and Chavez 1997; Perna 2000). Akerhielm et al. find that among the bottom third of all students, based on family income,

from the National Education Longitudinal Study of 1988 roughly 44 percent enroll in any level of postsecondary institution, compared to 86 percent of students from the top-third income group. This result appears counterintuitive given the disproportionately positive impact a college education—in particular those from selective colleges—has on the earnings of students from disadvantaged backgrounds (Dale and Krueger, 1999).

Thus, researchers have found differences between student groups in terms of both their college aspirations and their ultimate college enrollment. Disparities in college enrollment, however, cannot be explained by differences in educational aspirations alone; differences by race and family income are all smaller when comparing the groups' college aspirations than when comparing their actual college enrollment (Berkner and Chavez, 1997). Avery and Kane (2004) find that while 93 percent of suburban Boston students who intended to enroll in a four-year university at the beginning of twelfth grade held the same plans at the end of their senior year, only 36 percent of urban Boston students maintained the same belief throughout their senior year despite receiving college preparation coaching the suburban students did not. Thus, for these Boston students, differences in aspirations increase as the time of typical enrollment gets closer, indicating that there are forces intervening between a student's development of the desire to go to college and a student actually enrolling in college that lead to a disconnect between aspiration and actuality.

The few researchers who have examined the path to college enrollment note differences in the rate of completion of the various steps in applying to and enrolling in college between different groups of students, though there has been little commonality among researchers as to the group of application steps or the sophistication of the methods or models used for analysis. Avery and Kane (2004) use the most detailed list of college steps in the literature—including, among more commonly studied steps, taking the PSAT, meeting with a college counselor four or more times, or visiting a college and obtaining college applications—and note discrepancies in college application step completion between a group of at-risk urban Boston students and their better off suburban peers. They find that even among low income students with high educational expectations and high valuations of college benefits who had participated in the Boston College Opportunity and Career Help (COACH) college coaching program, the completion rate of these steps was lower than that of wealthier students. The weakness of the study with regard to the analysis of step completion is that the authors do not control for many student characteristics, giving only summary statistics of step completion by group.

In methodological contrast, Cabrera and La Nasa (2001) identify three tasks they claim are most likely to result in college enrollment: students taking courses that at least minimally prepare them for college, graduating from high school, and applying to college. But, rather than just a presentation of summary statistics, each of these tasks is also examined within a

multivariate logistic framework. This depth of analysis is held back by its application to only three basic steps.

Other studies of the steps to college enrollment have analyzed a more diverse list of steps than Cabrera and La Nasa, but have not looked as systematically at the completion of the steps analyzed. For example, Berkner and Chavez (1997) omit high school graduation, but add taking the SAT to the list of steps considered by Cabrera and La Nasa (2001). Berkner and Chavez describe group differences in SAT taking based on college qualifications and other background characteristics and then perform a broader weighted linear probability model of college enrollment that controls race, family income, parents' education, attaining college qualifications, and either taking the SAT/ACT and submitting a college application or not. The study does not, however, perform a multivariate analysis of the factors that influence whether a student becomes college qualified, take the SAT or ACT, or apply to college. Horn and Carroll (1997) examine a similar list of steps to college similar to Berkner and Chavez—including having college aspirations in 10th grade, obtaining minimal academic qualifications, taking college entrance exams, applying to college, and enrolling in college—but again only employ a multivariate framework with respect to the final step of the process.

Thus there are many well documented differences between groups of students that predict if they aspire to and enroll in college, but few studies that have carefully looked at the intervening steps between the development of aspirations and actual college enrolment. Those studies that have begun to look at these steps have produced intriguing results regarding the importance of step completion for college enrollment and have found descriptive differences in completion based on certain background characteristics, but have not looked at the joint contribution of numerous background characteristics to step completion. Though many studies look at how these differences contribute to college enrollment, no study has combined a large list of steps and a systematic analysis of how race, gender, socio-economic status, and academic achievement predict the completion of each step on its own and how the completion of each step then predicts further progress towards enrollment. Such an analysis will form the basis of this paper.

Theoretical Framework

Most previous research on the college choice process falls neatly into the three stages of college choice: "aspiration", "search", and "choice" (Hossler, Braxton, and Coopersmith 1989; Hossler and Gallagher 1987). The bulk of this research has been directed at the aspiration and choice (or enrollment) phases, with less attention having been given to the intervening search process. What little research has focused on the search stage of the process has been almost entirely concerned with how students gather information about colleges rather than the process of completing college applications (Perna 2006). Regardless of the stage college choice chosen

for study, these studies have attributed the gaps in college enrollment to inadequate financial aid, academic preparation, or access to information (Perna 2006)—aspects external to, or separate from, the actual college application *process*. Rather than treat the application process as a simple binary or as only of tangential importance, as previous research has done, this paper problematizes the application process, conceiving of the process as comprised of a series of steps each of which is a potential barrier to college enrollment.

In order to examine these intermediate steps to enrollment systematically it is worth considering theoretically how different steps create different kinds of barriers to progress for students aspiring to postsecondary enrollment. For example, some steps may take substantial effort while other steps may require prior work or academic achievement. In what follows I consider such costs to step completion using the human capital approach to model individuals' options and choices leading to step completion and college enrollment.

The basic human capital model posits that students make the decision to attend college by comparing the discounted lifetime earnings they expect to receive if they attend college to the direct (e.g., tuition) and indirect costs (e.g., foregone earnings) associated with attending college (Becker 1962). According to the human capital model, differences in rates of college attendance for students with the same ability to succeed at college should only exist if there are market failures such as imperfect capital markets for student loans or if differences exist in tastes for schooling. Therefore, given the ability to borrow, we would not expect to see students at the same ability level making different decisions about whether to attend college. However, as shown in the prior research discussed above and as I show again in the results below, this is not the case.

One reason for these findings is likely that human capital decisions are made under a great deal of uncertainty about future earnings and the probability of college completion. In the absence of empirical data about the returns to education, students must rely on the experiences and outcomes of students who have preceded them, and estimates of their own intellectual ability (Manski, 1990). Students might also face uncertainty with respect to their chance of completing a college degree and may change their decision to attend college in the face of updated information (Altonji, 1993).

In a further complication of human capital decisions, students make their decision to attend college from within varying labor market environments. Students' responses to labor market conditions and income expectations vary by race, class, and gender—groups that are likely to be more or less optimistic about their chances of completing a degree or more or less skeptical about the benefits of a degree (Beattie 2002). In a study that simulated students' expected returns to education in the manner originally proposed by Manski (1990)—that is, using the returns to education of individuals between the ages of 25 and 34 of the same gender

who live in the same state—Beattie (2002) finds that few race-SES-gender groups behaved as might be predicted by the human capital model. In fact, the only group for which the human capital model seems to apply is white males with low cognitive ability and from low socioeconomic background—other groups over- or under-invested in education, which Beattie suggests may be a result of students having more or less skepticism about the benefits of a college degree.

With all of these complications to the basic human capital model of the college attendance decision, the problem becomes even more complex with the additional consideration that the college attendance decision is not, as the basic human capital model presumes, a one-time decision. For every student who wants to attend college, that student must complete the lengthy and laborious process of applying to college. To apply for college, students have to clear a number of successive hurdles—taking standardized tests, writing application essays, applying for financial aid, etc.—each with its own separate costs and considerations. The failure to complete anyone of these steps could result in an inability to enroll in college. At each step students much essentially remake their human capital decision, weighing, for example, the cost of studying for and taking the SAT against the benefits of attending college all under the cloud of uncertainty that accompanies all human capital decisions.

To the extent that groups of students make different decisions when faced with these choices, just as they have in previous literature investigating a single college enrollment human capital choice, it is important to understand how the completion and interaction of different sets of steps lead to college enrollment, if at all, for different groups of students. Therefore, in this paper, I address the following research questions: (1) Is there a clear progression of steps that lead to college enrollment? And (2) To what extent do students from different backgrounds complete each step toward enrollment in a four year college? This paper is agnostic as to whether gender, race, family income or academic preparation affects students' choice sets or the choices that they make within those sets, but it does identify which choices are most heavily functions of each of these background characteristics, providing information for future research investigating the causal pathway for the observed outcomes. By looking at each step in a consistent way, this study is able to identify clearly the relationship between race, family income, academic preparation, and step completion as well as between the completion of different steps.

Data

I analyze data from the Education Longitudinal Study of 2002 (ELS), which represents a cohort of students previously unexamined in the college pathway literature. The ELS is a nationally representative, survey-based dataset designed to track a single cohort of high school students from tenth grade through college and as they enter the workforce. The data also contains student test score information, transcript data and financial aid data where available. Data for this

study come from the first three rounds of ELS data collection which surveyed students in 2002 when they were in 10th grade, and again in 2004 and 2006. The sample began with over 15,000 tenth graders from 150 schools in 2002 and was "freshened" with additional twelfth grade students in 2004 to make the sample representative of both 2002 10th graders and 2004 twelfth graders. In order to focus on students throughout the college application process and how the completion of early steps might impact the completion of later steps, I focus solely on students who appear in all three rounds of ELS data collection, so freshened data is not included. Sample weights are used to maintain the representativeness of the sample.

Background Characteristics

Descriptive statistics of students in the ELS sample for characteristics of interest--including gender, race, socioeconomic status, and academic achievement—are presented in Table 1. The population of students in the analysis represents the population of high school age students as a whole. They are 51 percent female and a majority identify as white (63 percent). Fourteen percent of students are Hispanic while 13 percent are black. The ELS survey allowed students to identify as multi-racial, but did not include more detailed data about what the multiple races were so these students are included as a separate racial subgroup that comprises roughly four percent of the sample. An additional four percent of the students are Asian or Pacific Islander, while less than one percent are Native American.

I collapsed the 13 income groups described in the ELS data into 5 income groups in order to even out the distribution of students between the groups and for ease of analysis. These groups roughly divide the data into quintiles with the exception of the group of students with families earning between $25,000 and $35,000 a year, which comprise only 12 percent of the sample and those students who come from families earning more than $75,000 a year—the top group identifiable in the data—which make up 28 percent of the sample.

I measure student achievement using the student's ninth and tenth grade GPA based only on students' grade in academic classes and students' scores on the ELS academic assessment in tenth grade. Summary statistics are provided in Table 1. Mean student GPA is roughly the same between ninth (2.69) and tenth (2.65) grade. For purposes of analysis, I standardize student GPAs to a mean of zero and standard deviation of one. The ELS composite score is a combination of a students' scores on a reading and math test administered to all ELS subjects in the tenth grade. The average score on the ELS exam was 50, with a standard deviation of roughly ten.

Steps to College

I track students as they progressed through ten steps of the four-year college admissions process. These steps include tenth grade college aspirations, twelfth grade college aspirations, attaining minimal college qualifications, taking college entrance exams (SAT or ACT), meeting with a college counselor or college representative, applying to college, applying for financial aid, acceptance to college, and enrolling in college. Because of the differential benefit of a selective college degree for at risk students (Dale and Krueger, 1999), I also look at application, acceptance, and enrollment at highly selective colleges to determine if the process leading to enrollment at selective schools differs from four-year schools in general.

Students might complete steps to college without knowing for sure whether they will attend or complete a four-year college degree so I consider students as having aspirations for college if they responded that they did not know how far they would continue their education or if they expected that they might start, but not necessarily finish a four-year degree in addition to students who expected to earn a four-year degree or higher. If a student does not know how far he will get in school it is more likely that he has doubt regarding how far beyond high school he will continue (e.g. Bachelors vs. Masters degree) than if he has doubt about finishing their schooling at the end of high school, which is a more proximal event.[1] I account for college aspirations in both tenth and twelfth grade in order to consider the persistence of aspirations.

Based on the classification system developed by Berkner and Chavez (1997), I consider students to have achieved minimal qualification for college if they fell in the top 75 percent of students who intended to attend at least a four-year college in any of the following categories: cumulative GPA, SAT score, ACT score, tenth grade ELS test composite score, or 12th grade ELS math composite score.[2] This includes any student with a GPA above 2.35, an SAT score at or above 900, or an ACT score at or above 19. Students are also classified as minimally qualified for college if they have completed four-years of English; 3 years each of social studies, math, and science; and two years of a foreign language.

I count students as applying to a college if they reported applying to colleges in either the 2004 or 2006 rounds of the surveys, if they reported being accepted to a four-year college, or if they enrolled in a four-year college. Students are counted as applying for financial aid only if they also applied to a four-year college and reported applying for any form of financial aid. While this does not capture the full population of students who applied for financial aid, it allows for analyses that do not conflate applicants for financial aid who intend to attend a two-year college and those that intend to apply to a four-year college.

For enrollment, I consider the level of the first college the student enrolled in after high school, if they enrolled at all. If a student has enrolled in any four-year college or university, then I count them as having enrolled. Application and enrollment to college are also considered for students who applied to and enrolled in any four-year college and whether they applied to and

enrolled in a four-year college categorized as "most selective" based on the 2005 Carnegie classifications.

Figure 1 summarizes the percent of students who completed each of the steps. As suggested by previous literature, there is a decrease in the absolute percentage of students who complete each of the steps to college. Eighty to 86 percent of students either entertain the possibility of attending a four-year college, take the SAT or ACT, or attain minimal academic qualifications for college are completed. Nearly 20 percent fewer students complete the next set of steps, with 49 to 64 percent of students either visiting a college counselor or meeting with a college representative, applying to a four-year college, or applying for financial aid. Another 20 percentage point drop finds 40 percent of students ultimately enrolling in a four-year college or university.

Methods

Analysis proceeds in two sections, each one addressing one of the two main research questions.

Question 1: Is there a clear progression of steps that lead to college enrollment?

In answering the first question, I provide largely descriptive statistics and break down the data in ways that illustrate the different paths various groups of students take through the admissions process. I also compare the proportions of students who complete a given step conditional on having completed others.

Question 2: To what extent do students from different backgrounds complete each step toward enrollment in a four year college?

I run logistic regressions for each application step controlling for gender, race, socioeconomic status, and academic achievement. In cases where it is clear that certain steps must have preceded others, I control for the completion of prior steps. Thus, for tenth grade college aspirations I include just gender, race, family income, and academic achievement variables. I add a control for having had college aspirations in tenth grade into the models twelfth grade college aspiration and taking the SAT or ACT, and meeting with a college counselor.

I also include tenth grade aspirations in the regression predicting attainment of minimal academic qualifications for college, but the academic achievement variables are dropped from the model because these variables are used directly in creating the minimum qualification variable (resulting in colinearity). In order to investigate the attainment of college qualifications more fully, I run an additional logistic regression based on student attainment of minimal

qualifications by completion of the minimum number of academic units, independent of qualification by other means such as test scores or GPA. This allows for the GPA and ELS composite score controls to be added back in to the set of baseline controls.

All other steps include additional controls for twelfth grade aspirations, taking college entrance exams, attaining minimal college qualifications, and meeting with a college counselor or college representative. The models that predict enrollment in any four year college or a selective four-year college contain an additional control for students' application for financial aid. Because no student was accepted to a college without having applied, and no student enrolled without having both applied and been accepted, application to a four year college (either selective or non-selective) and acceptance to a four year college (either selective or nonselective) are not used as control variables.

All but five regressions are performed using the entire population of students for whom data is available. Regressions of financial aid application are limited to just those students who applied to a four-year college. Similarly, regressions of four-year college enrollment and selective four-year college enrollment are limited to students who were accepted to a four-year college or a highly selective four-year college, respectively. Finally, acceptance to any four-year college or a highly selective four year college is predicted only among students who applied to a four-year or highly selective four-year college, respectively.

My analysis takes advantage of the unusually rich data provided by the ELS, which makes it possible to compare a uniform set of measures across a large set of admissions steps and look broadly at the collection of factors that influence students both in terms of individual step completion—even after considering the completion of earlier steps—and over the entire admissions process. Without an experimental or quasi-experimental design, I cannot account for all possible omitted variable bias, so one should avoid attributing causality to the factors that I test. The methods I employ allow for a broad look at the factors that affect individual step completion on the path to college enrollment and will suggest fruitful areas for future research to explore more deeply.

Results

Is there a clear progression of steps that lead to college enrollment?

As Figure 1 demonstrates, there is an absolute decrease in the percentage of students that complete each individual admissions step (with the exception of taking college entrance exams), but these steps do not at first appear to represent a clear step-by-step path to college. That is, it is not the case that the students who complete one step are comprised of all of the students who completed the step before, minus those who have fallen out of the process. For example, 72

percent of students who are minimally qualified for college also apply to college, while 11 percent of the students who apply to college are not college qualified. Similarly 90 percent of students who, when asked in twelfth grade, have plans to enroll in a four-year college take college entrance exams and 12 percent of those students who take the exams do not express the desire to attend a four-year college.

This variability in the groups of students who complete each step is illustrated in Figure 2, which presents the total percent of students who complete each step as well as the percent of students who also completed all prior steps (to left of the step in the figure). Thus we see that while 81 percent of students had four-year college aspirations in the twelfth grade, only 76 percent of students had the same aspirations in 10th grade. Even more dramatically, only 83 percent of the students who applied to a four-year college had completed all prior college application steps.

Such variability, however, is not evident in the population of students who ultimately enroll in college. Indeed, despite the variation in completion of the steps to college of high school students overall, when the arguably optional steps of applying for financial aid and meeting with a college counselor or college representative are omitted from analysis, the importance of the completion of the remaining steps becomes clear; ninety-five percent of students who ultimately enroll in a four-year college or university complete all five of the remaining steps.

In short, completion of the five steps discussed above—bachelors aspirations in tenth and twelfth grade, taking the SAT or ACT, attaining minimal college qualifications, and actually applying to college—appears vital in determining which students ultimately enroll in college and which do not. Students who enroll in four-year colleges nearly always complete all of these steps.

To what extent do students from different backgrounds complete each step toward enrollment in a four year college?

Table 2 presents the step completion rate of students grouped by race, family income, and performance on the ELS math and reading assessment, with significant differences tested using white students as the reference group for race, and the middle income and achievement score quintile groups (both roughly capturing median students) as comparisons for income and achievement.

There is little difference between racial groups in terms of initial tenth grade aspirations for four-year college attendance, though gaps between racial groups grow as the application process progresses. Only Asians and Hispanic students differ significantly from white students in

terms of their tenth and twelfth grade college aspirations with significantly more Asian students, and significantly fewer Hispanic students, having four-year aspirations at each grade. Hispanic, Native American, and multiracial students decrease relative to other racial groups in terms of taking college entrance exams, falling as much 17 percentage points behind white students. Black students maintain rough parity with white students throughout these first three steps, but are 23 percentage points less likely to have attained minimal academic qualifications for college than white students; only Native Americans are less likely than black students to attain minimal college qualifications.

Relative to other steps at similar stages in the college application process, racial differences are small when it comes to seeking information from a college counselor or college representative, though only Asian students are not significantly lower than whites students in the rate at which they complete this step. Multiracial, black, and Hispanic students complete this step at roughly the same rate, about 58 percent, while Asians and white students complete it slightly more often and Native Americans complete it slightly less often. Still the gap between Asian students (highest complete rate) and Native Americans (lowest complete rate) is nearly 20 percentage points.

All groups decline steeply in the percent of students who apply to four-year colleges compared to prior steps. All groups fall between 15 and 25 percentage points compared to the percentage who took college entrance exams. Hispanics and Native Americans fall particularly far behind other racial groups at the point of application to college. While even white and Asian students decline in the percent of students who apply to college compared to the percent that attained minimal college qualifications, roughly the same percentage of black students who are college qualified also apply to college. Furthermore, about 65 percent of black students apply to college, about the same rate as white and multi-racial students. Though the small gap in the college application rate of black and white students belies the large gap that existed between the two groups at the stage of attaining college qualifications, the gap between Hispanics and whites is more bleak; the initial 3 percentage point gap between whites and Hispanics with respect to tenth grade college aspirations grows to 18 points for minimal academic qualification and is just as large at the time of application.

With some variation, most racial groups appear to be accepted to four-year colleges in the same relative proportion as they apply, though there are large differences by racial group in terms of who of these accepted students go on to enroll at a four-year college. Asian and white students enroll at the same relative rates at which they were accepted, but other racial groups enroll at much lower rates relative to that at which they were accepted. In the end, while over half as many Hispanics and Native Americans are accepted to four-year colleges as Asians, only about one third as many enroll in four-year colleges. Furthermore, black students are accepted to four-year colleges at about the same rate as white students, but are about two thirds as likely as

white students to convert that acceptance into college enrollment. Racial differences are particularly stark when it comes to application and enrollment at highly selective four-year colleges and universities. Here, black and Hispanic students apply at half the rate of Asians, and two-thirds the rate of whites and enroll at even lower rates.

A similar, if even clearer, pattern is seen when step completion is broken down both by family income and by ELS composite score.[3] Within each of these groupings there is a monotonic decrease in the percentage of students who complete each step from high to low income and high to low academic achievement, gaps that largely grow as the application process progresses. As with racial differences, the smallest gaps exist between students with respect to students' college aspirations in tenth grade—about 11 and 23 percent between the highest and lowest income and achievement groups, respectively. From tenth grade aspirations, the gap between high and low income and high and low achieving students only gets larger with the exception of the proportion of students who visit their college counselor or meet with a college representative, where the gaps tighten somewhat. The gap also shrinks in between income groups with respect to applying for financial aid. Though this difference is expected because of the lower need for financial aid among students from high earning families, students from the highest two family earning groups apply for aid significantly more than students from the middle income group, and there is a 17 percentage point gap between the high and low groups.

Despite the two steps where gaps appear to narrow, gaps between income and academic achievement groups continue to increase even after students have applied to college. A significantly higher and lower percentage of students from the top and bottom two income and achievement groups are accepted at four-year colleges than comparison group students, respectively. When it comes to college enrollment, the students from the highest income groups enroll at a rate approximately 50 percent greater than the next lowest income group—those students from families earning between $50,000 and $75,000—and almost three times the rate of students from families earning under $25,000 a year. Likewise, the gap between highest and lowest academic achievement group grows from 53 percentage points at the time of application, to 61 and 65 points for acceptance and enrollment, respectively. The differences seen between racial groups and application and enrollment at highly selective four-year colleges is reflected in an even more stark disparity between income groups with respect to the completion of these steps. The highest income group, for example, applies to selective colleges at nearly five times the rate of the lowest income group, and enrolls at such colleges at six times the rate of the lowest income group.

Thus it appears that many differences that are observed in college enrollment between different race, income, and academic achievement groups begin well before the point at which a student is in a position to enroll in college. While these findings are a cause for concern, it is possible that differences between race, income, and academic achievement groups present a

simple explanation for a much more complex problem. Using multivariate logistic regression allows me to look at how many factors at once contribute to the likelihood a student with a given set of background characteristics will complete a particular application step.

Many race and income differences in the tenth grade college aspirations are diminished or reversed once controlling for race, family income, gender, and academic achievement. As seen in Table 3, all else equal, black students are over three times more likely than white students to have aspirations to attend a four year college. Likewise, Asian, Hispanic, and Native American students are over twice as likely as their white peers to have four-year college aspirations in tenth grade. Compared to a student from a family from the middle (roughly median) income group, only students from the highest income group are significantly more likely to have tenth grade college aspirations—the remaining three income groups do not differ significantly from the average income group once accounting for race, gender, and academic achievement. All academic variables have a strong association with tenth grade; one standard deviation increase in a student's ninth or tenth grade GPA is associated with between a 21 and 36 percent greater likelihood that they will express interest in attending college in tenth grade college aspiration. Similarly, a one point improvement in students' ELS composite scores is associated with an eight percent greater likelihood they will have college aspirations in tenth grade.

Many of these patterns, such as the reduction or reversal of racial differences, are consistent across all steps. Black students are more likely than white students to complete all steps except to attain minimal college qualifications (though they are more likely to complete the required units to attain such qualification) and enroll in a highly selective college. Adding controls for academic achievement and family income does not change that Asian students generally outperform white students in terms of admission step completion. Though Asian students appear significantly less likely to be accepted to college in general—they are no more likely to be accepted at a selective college—they are statistically as or more likely than white students to complete every other step in the application process. Hispanic and Native American students, like black students, are less likely to have achieved minimal college qualifications, but are no less likely than white students to complete any other step in the process and are, in fact, at least 40 percent more likely than white students to have aspirations to attend college in either tenth of twelfth grade.

Including the additional controls also reveals that there are fewer group differences by income than are seen in the purely descriptive analysis. Significant differences exist across all steps only for students in the highest income group. All else equal, students from families in the highest income group are significantly more likely than students in the middle income group to complete every step in the admission process except apply for financial aid. Students from families in the next highest income group, earning between $50,000 and $75,000 a year, are

significantly more likely to be college qualified, apply to selective colleges, and enroll in any four year college, but less likely than middle income group students to apply for financial aid. Students from the lowest income group are not generally different than middle income students, though they are significantly less likely to attain minimal college qualifications and apply to college.

Many of the shifts in racial and family income patterns of step completion from the pure descriptive analyses to the logistic regression analysis are due to the strong influence of academic factors. Students with better grades and higher ELS composite scores are much more likely than students with lower GPAs and scores to complete every step of the admissions process. The strength of these associations is stronger for the aspirations steps, taking the SAT or ACT, and both applying and enrolling in any level of four-year college than it is for earning the number of units required to attain minimal academic qualifications for college, meeting with a college counselor or college representative, and applying for financial aid, though all effects are positive and significant.

The repeated importance of student characteristics such as race and academic achievement are notable due to the fact that, where appropriate, the step prediction regressions control for the completion of prior steps. Each odds ratio for each control variable represents how that variable is associated with completion of the given step while essentially controlling for how that variable might have impacted the student's completion of prior steps. Thus it does not seem to be the case that high income students are more likely to have college aspirations in tenth grade, and this difference in aspiration is what leads this group of students to complete all of the steps more frequently than other students. Rather, high income students, independent of college aspirations in tenth grade, are more likely than average income students to complete nearly every step in the admissions process.

This does not mean that prior step completion is irrelevant; student completion of application steps is nearly always important in terms of predicting completion of later steps, though some steps are more predictive than others. For example, in the early stages of the application process, having had tenth grade college aspirations makes students three to four times more likely to complete any given subsequent step, short of applying to college and visiting a college counselor, which students are only 80 percent more likely to complete. These effects are some of the largest in the entire analysis.

Both twelfth grade college plans and taking the SAT or ACT are strongly predicative of four-year college application, regardless of school selectivity.[4] Thus, while it is difficult to skip any steps in the admissions process and still enroll in college, not taking college entrance exams or not planning on attending college as of twelfth grade is particularly detrimental to the chances of applying to college.

Interestingly, having visited with a college counselor or college representative is also significantly and positively associated with application to a four-year college. Though students who complete this step are only 90 percent more likely to apply to college than students who do not—a relatively small effect compared to twelfth grade plans and taking the SAT or ACT—this effect is comparable to the effect of having tenth grade plans to attend college and is greater than that of attaining minimal college qualifications. Thus, although this step to college enrollment is technically optional, it appears to have a more important role to play in the college application process than the steps that are required.

Finally financial aid appears to play contradictory roles in terms of college enrollment. While application for financial aid is positively associated with enrollment at any four-year college—leading to a 55 percent increase in the chances a student will enroll in any four-year college than students who did not apply for financial aid—it is associated with at 48 percent reduction in the likelihood that a student will enroll at a highly selective college, even when controlling for family income. If application for financial aid is a signal of a family's uncertainty about its ability to afford college, this finding suggest that financial aid, from all sources, is not always enough to bridge the gap between a family's ability or willingness to pay for a highly selective college and the college's tuition.

Thus, by simultaneously controlling for race, family income, academic achievement, and the completion of prior application steps, I have shown that observed group differences in step completion are largely a result of academic achievement. After controlling for all of these factors, racial differences in step completion nearly disappear and sometimes reverse, and income differences are greatly reduced. Furthermore, even steps that are not explicitly required for college admission, such as visiting with a college counselor or college representative, are strongly associated with success on the path to college enrollment.

Conclusion

In this study I have identified five steps on the path to college enrollment that nearly every student who enrolls in college completes. These steps are having college aspirations in tenth grade, having the same aspirations in twelfth grade, taking the SAT or ACT, attaining minimal college qualifications, and applying to college. A student who skips any one of these steps is unlikely to enroll in college. Thus, a student's decision to complete any one of these steps is tantamount to deciding whether or not they will enroll in college. Even beyond this list of five steps, other steps such as seeking out guidance from a college counselor or college representative, which at first seem optional, have a significant impact on the chances that a student will ultimately apply to a four-year college. For these reasons it is important for scholars

and policy makers looking to increase college enrollment to consider the entire path to college enrollment and factors that lead to individual step completion.

There are consistent step-wise drops in the percentage of students who have college aspirations in tenth grade to those students who ultimately enroll in college as well as concerning differences when comparing the admissions step completion rates of students by racial, family income, and academic achievement groups. With controls for race, family income, academic achievement, and prior step completion, however, many income differences and most racial differences disappear, indicating that academic preparation may be a better predictor of admissions step completion than race and family income on their own. Importantly, the effects of the covariates I use are not uniform across steps: certain factors better predict completion of some steps over others. For example, with further research, such findings may help to identify the particular policy levers that can be used to address shortcomings in the completion rates of particular steps, allowing for targeted efforts to reduce gaps in college attendance rates.

The results of this study describe a previously unexamined cohort of students in a multivariate framework. These methods go beyond previous descriptive studies of application step completion in that they systematically predict step completion controlling for multiple background characteristics and previous step completion; no prior study has looked at this set of steps in this way. While these methods allow for the careful description of group differences and the measurement of associations between step completion and various other factors, they does not allow for causal claims. Further, the limited set of covariates only hints at possible mechanisms underlying observed patterns in the data. It may be, for example, that income differences represent differences in parental education and thus parents' knowledge of the application process and potential to guide their child through the often confusing application steps. Further research should attempt to describe more thoroughly the causal mechanisms behind these results.

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Table 1
Descriptive Statistics of Sample

	Percent of Sample	Mean (SD)
Race/Ethnicity		
White	63.35	
Hispanic	14.06	
Black	13.25	
Multiracial	4.26	
Asian	4.14	
Native American	0.95	
Gender		
Female	51.15	
Family Income		
$0-25,000	19.15	
$25,000-35,000	11.77	
$25,000-50,000	19.28	
$50,000-$75,000	21.95	
Over $75,000	27.86	
Academic Achievement		
GPA -9th grade		2.69 (0.86)
GPA -10th grade		2.65 (0.86)
ELS Composite Score		51.44 (9.79)

Table 2 (part 1 of 2)
Percent of Students who Completed Application Steps, by Group

	Bachelor's aspirations, 10th grade	Bachelor's aspirations, 12th grade	Took SAT or ACT	Minimal academic preparation	Sought college guidance	Applied to 4-year college
Race/Ethnicity						
White	89.2	81.7	85.1	90.4	65.9	65.1
Asian	94.3 ***	89.2 ***	88.5 **	92.1	68.6	76.3 ***
Black	89.5	81.9	84.5	67.0 ***	59.4 ***	65.2
Hispanic	86.5 ***	74.8 ***	72.6 ***	72.5 ***	57.0 ***	48.0 ***
Multi-racial	88.9	81.4	80.6 ***	83.7 ***	59.5 ***	60.8 *
Native American	88.1	75.4	68.5 ***	60.2 ***	49.8 ***	45.6 ***
Family Income						
$75,000+	94.4 ***	90.8 ***	92.1 ***	93.9 ***	70.6 ***	79.1 ***
$50,000-75,000	90.5 ***	82.9 ***	84.3 ***	87.9 ***	64.4	64.9 ***
$35,000-50,000	87.2	77.9	80.6	83.2	62.3	57.8
$25,000-35,000	85.6	73.8 ***	78.4 *	80.6 **	61.4	55.0 *
$0-25,000	83.5 ***	71.8 ***	73.9 ***	69.8 ***	54.6 ***	46.7 ***
ELS Composite Quintile						
Top 20%	97.9 ***	96.1 ***	97.0 ***	100.0	74.4 ***	87.9 ***
60-79 %	95.2 ***	88.8 ***	92.1 ***	100.0	70.0 ***	76.0 ***
40-59%	91.9	83.5	87.6	100.0	66.6	64.6
20-59%	85.1 ***	73.8 ***	76.2 ***	66.3 ***	58.9 ***	51.8 ***
Bottom 20%	75.2 ***	62.5 ***	62.8 ***	29.5 ***	47.5 ***	34.5 ***

Reference group for race is "white", for income is $35,000-50,000, and for ELS Composite is the 40-59th percentile
Significant differences from reference group indicated by *** p<0.01, ** p<0.05, * p<0.1.

Table 2 (part 12of 2)
Percent of Students who Completed Application Steps, by Group

	Applied for financial aid	Accepted at 4-year college	Enrolled in 4-year college	Applied to selective 4-year college	Accepted at selective 4-year college	Enrolled at selective 4-year college
Race/Ethnicity						
White	49.9	60.7	44.7	33.90	27.9	18.8
Asian	59.6	68.3 ***	54.9 ***	50.50 ***	40.4 ***	30.6 ***
Black	53.6 ***	55.2 ***	30.6 ***	22.40 ***	11.9 ***	5.3 ***
Hispanic	36 ***	39.7 ***	22.6 ***	16.10 ***	10.4 ***	6.2 ***
Multi-racial	48.9	56.1 **	36.9 ***	29.10 **	20.6 ***	12.8 ***
Native American	37 ***	39.5 ***	20.7 ***	18.80 ***	12.8 ***	6.8 ***
Family Income						
$75,000+	54.9 ***	75.8 ***	61.4 ***	50.70 ***	42.1 ***	30.5 ***
$50,000-75,000	52 ***	59.5 ***	41.3 ***	30.00 ***	23.8 ***	14.4 ***
$35,000-50,000	48.5	51	31.9	23.50	17.2	10.1
$25,000-35,000	45.6 *	47.4 **	27.5 ***	18.20 ***	12.0 ***	7.0 ***
$0-25,000	37.8 ***	38.4 ***	21.0 ***	14.70 ***	9.0 ***	4.9 ***
ELS Composite Quintile						
Top 20%	71.8 ***	87 ***	73.9 ***	62.90 ***	57.7 ***	43.8 ***
60-79 %	58.7 ***	72.8 ***	54.0 ***	40.20 ***	33.2 ***	20.4 ***
40-59%	49.9	58.2	38.1	24.80	15.8	8.7
20-59%	38.6 ***	42.3 ***	23.5 ***	15.90 ***	8.1 ***	3.6 ***
Bottom 20%	24.9 ***	25.1 ***	8.9 ***	7.70 ***	2.6 ***	0.7 ***

Reference group for race is "white", for income is $35,000-50,000, and for ELS Composite is the 40-59th percentile
Significant differences from reference group indicated by *** p<0.01, ** p<0.05, * p<0.1.

Table 3, part 1 of 2
Logistic Regression of Steps in College Application Process

(n=10620)	Bachelor's aspirations - 10th grade	Bachelor's aspirations - 12th grade	Took SAT or ACT	Attained minimal college qualifications...by any criterion	Attained minimal college qualifications...by units	Met with college counselor or representative
Black	3.175 ***	2.778 ***	2.887 ***	0.258 ***	1.788 ***	1.304 ***
Asian	2.270 ***	2.269 ***	1.070	1.279 *	1.403 ***	1.044
Hispanic	2.042 ***	1.446 ***	1.002	0.358 ***	1.196 **	1.004
Native American	2.303 **	1.662	0.875	0.159 ***	0.511 **	0.665
Multiracial	1.588 **	1.393 *	0.982	0.562 ***	0.835	0.887
$0-$25,000	0.862	0.930	0.845	0.582 ***	0.871	0.873
$25,000-35,000	0.992	0.841	0.944	0.875	1.085	1.043
$50,000-75,000	1.237	1.214 *	1.081	1.272 **	1.178 **	0.998
$75,000+	1.610 ***	1.932 ***	1.593 ***	2.265 ***	1.511 ***	1.148 *
GPA - 9th Grade	1.358 ***	1.323 ***	1.427 ***		1.253 ***	1.151 ***
GPA - 10th Grade	1.209 ***	1.377 ***	1.493 ***		1.474 ***	1.266 ***
ELS Composite	1.081 ***	1.054 ***	1.069 ***		1.045 ***	1.020 ***
Female	1.762 ***	1.168 **	1.146 *	1.350 ***	1.066	1.225 ***
Bachelor's aspirations - 10th grade		4.148 ***	3.067 ***	4.260 ***	3.049 ***	1.840 ***
Bachelor's aspirations - 12th grade						
Took SAT or ACT						
Attained minimal college qualifications						
Met with college counselor or representative						
Applied for financial aid						
Constant	0.110 ***	0.072 ***	0.076 ***	1.838 ***	0.021 ***	0.368 ***

Results presented as odds-ratios. *** p<0.01, ** p<0.05, * p<0.1.

Logistic Regression of Steps in College Application Process

	Applied to 4-year college	Accepted at 4-year college	Applied for financial aid	Enrolled in 4-year college	Applied to selective college	Accepted selective college	Enrolled in selective college
Black	3.075 ***	1.572 ***	2.014 ***	1.338 **	1.855 ***	0.921	1.037
Asian	1.785 ***	0.640 ***	0.923	1.553 ***	2.653 ***	0.909	1.856 ***
Hispanic	1.162	0.905	0.989	0.988	1.087	0.746	1.095
Native American	1.239	1.288	2.052	0.934	1.590	1.785	1.388
Multiracial	1.256	1.287	1.369	0.892	1.337 *	0.786	1.004
$0-$25,000	0.804 **	0.865	0.989	0.906	0.897	0.914	0.891
$25,000-35,000	1.097	1.015	0.980	1.022	0.952	1.266	1.220
$50,000-75,000	1.191 *	1.348 *	0.720 ***	1.310 **	1.22 **	1.473 *	1.021
$75,000+	1.727 ***	1.907 ***	0.361 ***	2.177 ***	2.270 ***	1.383 *	1.605 ***
GPA - 9th Grade	1.272 ***	1.187 *	1.230 ***	1.259 ***	1.306 ***	1.693 ***	1.092
GPA - 10th Grade	1.547 ***	1.671 ***	1.279 ***	1.334 ***	1.385 ***	1.533 ***	1.553 ***
ELS Composite	1.036 ***	1.071 ***	1.015 ***	1.045 ***	1.070 ***	1.082 ***	1.054 ***
Female	0.899	1.118	1.264 ***	1.125	0.890 *	0.953	0.914
Bachelor's aspirations - 10th grade	1.874 ***	1.121	1.000	1.156	2.117 ***	0.736	0.628
Bachelor's aspirations - 12th grade	4.127 ***	1.689 ***	1.322 *	3.604 ***	5.324 ***	2.339 *	7.744 **
Took SAT or ACT	4.419 ***	1.444 *	1.581 **	3.992 ***	4.346 ***	1.074	0.438
Attained minimal college qualifications	0.958	0.863	1.172	1.297	0.802	0.763	2.568
Met with college counselor or representative	1.871 ***	1.089	1.299 ***	1.543 ***	1.513 ***	1.127	1.311 **
Applied for financial aid				1.553 ***			0.520 ***
Constant	0.008 ***	0.089 ***	0.624	0.003 ***	0.000 ***	0.016 ***	0.012 ***
Observations	10620	7210[1]	7210[1]	6560[2]	10620	3680[3]	2940[4]

Results presented as odds-ratios. *** p<0.01, ** p<0.05, * p<0.1. [1]Of students who applied to four-year colleges. [2]Of students admitted to four year colleges. [3]Of students who applied to selective colleges. [4] Of Students accepted to selective colleges.

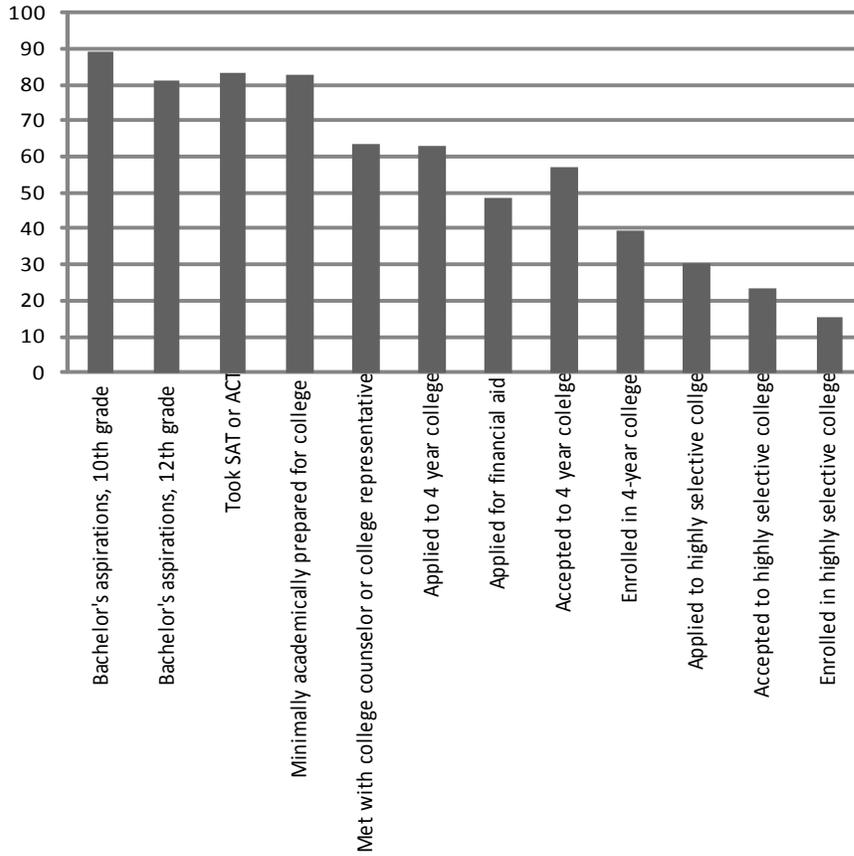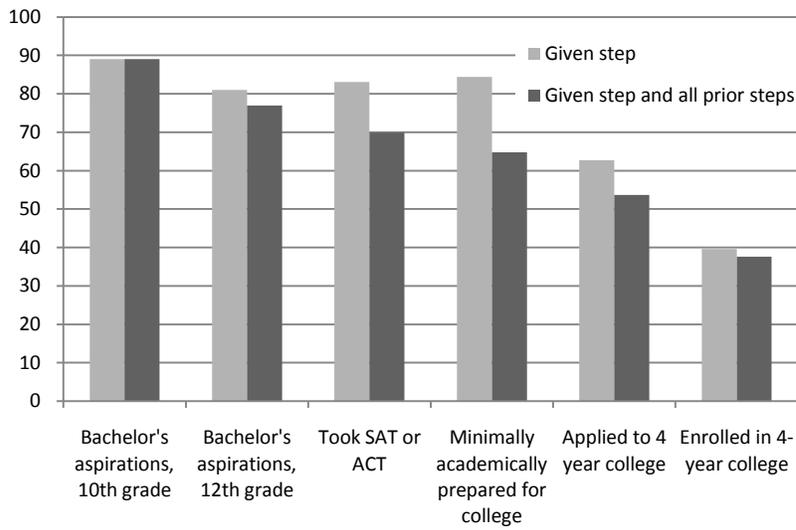Figure 1: Percent of Students who Completed the Given Step to College

Figure 2: Conditional Step Completion

Notes

[1] The results are not qualitatively different if "do not know" is not counted as having college aspirations. The one exception to this is noted in the results section. Results from this alternative specification are available from the author upon request.

[2] I follow the college qualification criteria established Berkner and Chavez for the 1992 National Education Longitudinal Study, but recalculate the 25th percentile cut-points using the new ELS: 2002 data. My scale further differs from Berkner and Chavez in that I do not include class rank data because this is not part of the ELS data. Furthermore, Berkner and Chavez use composite (English and math) NELS test results from students' senior year of high school. ELS administered a composite exam during 10th grade, but only a math exam during 12th grade—I allow for students to be considered minimally college qualified if they fall in the top 75 percent of college aspiring students on either exam.

[3] Similar results are found if academic achievement is measured by 9th or 10th grade academic GPA.

[4] Removing the "don't know" responses from 12th grade aspirations greatly reduces the magnitude and significance of the impact of 12th grade plans on selective college enrollment.