November 14, 2009
Preliminary Draft

Playing the College Application Game: Critical Moves and the Link to Socio-Economic Circumstances

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1. Introduction

In the U.S., there is a systematic relationship between family circumstances and college enrollment choices. Students from families with relatively low incomes ("Low income students") are much more likely to enroll in community colleges or open access four-year institutions and much less likely than more affluent peers ("High income students") to enroll at highly selective private colleges or at public flagship colleges around the country (Bound, Lovenheim and Turner (2007)).[1] To the extent that differences among these institution types have real effects on college completion rates and future income, such differences in college choice may have lasting consequences, exacerbating intergenerational differences in family circumstances.

In recent years, many selective institutions have enacted programs to recruit and support low-income students, replacing loans with grants for students in the lowest income groups while extending the reach of need-based aid to moderate and upper income families. In fact, high-achieving, low-income students are likely to face lower net prices of attendance at top tier private universities and well-endowed public universities than at less selective institutions.[2] The combination of non-discriminatory admissions standards, generous financial aid programs and differential enrollment outcomes for high and low-income students with strong academic qualifications presents a logical puzzle.

[1] To illustrate, among high-income and low-income students in the top quartile in math test scores in NELS 1992, high-income students were more than twice as likely to begin college at a highly selective private institution and more than 1.5 times as likely to begin at a top-50 public institution. In contrast, low-income students were nearly twice as likely as high-income students to begin at a community college.

[2] The Project on Student Debt (2008) shows that for moderate income families (e.g., incomes between $80,000 and $120,000) new aid initiatives may push the net cost of attending a selective private well below the cost of the public colleges and universities. This conclusion is consistent with the findings of Hill, Winston, and Boyd (2005), who used institutional data to assess financial aid packages at a set of highly selective private colleges and universities.

Systematic differences in academic preparation between high and low-income students explain some,[3] but not all of these discrepancies in enrollment patterns.

Recent empirical work highlights the role of potential "undermatch" in collegiate choice as an explanation for the different collegiate outcomes of academically comparable students from different socio-economic circumstances.[4] Bowen, Chingos, and McPherson (2009) link secondary academic records and collegiate outcomes for the state of North Carolina and find that among students in the bottom quartile of family income, nearly 60% of the students with SAT scores and high school grades in the range needed to enroll at a very selective university failed to do so. Similarly, Roderick et al (2006) find evidence of "undermatching" for graduates of the Chicago Public Schools.

We focus in this paper on the differences in college choices between high- and low-income students that are the result of systematic differences in where they apply to college. With assistance from the College Board, we identified a representative set of high school seniors with high test scores throughout Virginia and then conducted detailed surveys of these students and their parents over the course of the college admissions cycle in 2007-2008. The geographic concentration of these students provides considerable overlap in their college options and choices, allowing us to focus on public four-year colleges in Virginia and highly selective private colleges in Virginia and elsewhere.

[3] Differences between low-income students and their more affluent peers in measures of achievement start in early grades and widen through the hurdles that lead to enrollment at selective colleges (Ellwood and Kane, 2000; Bowen, Kurzweil and Tobin, 2004). The gap between high-income and low-income students is particularly marked at the top of the distribution of achievement from which top tier colleges and universities are likely to draw students. (Hill, Winston and Boyd, 2005).

[4] "Matching" of students to colleges can be quantified in terms of the alignment between student achievement and the achievement of the overall population of students at a given college (Roderick et al., 2008; Dillon and Smith, 2009). Note that a full characterization of the matching problem includes measurement of students who are both "overplaced" and "underplaced."

A primary finding is that low-income students submit fewer applications on average, and also are less likely to apply and enroll at selective colleges than high-income counterparts with similar academic qualifications. These differences in choices between low-income and high-income students are consistent with previous studies based on data from (1) admissions offices at a small set of selective colleges (Spies, 2001, Avery et. al (2005)), (2) standardized tests, including the set of colleges where each student sent his test scores (Card and Krueger (2005), Long (2004), Pallais and Turner (2006), and Pallais (2009)), (3) national longitudinal studies (Howell (2004), Long (2004)).

Our survey approach offers several significant advantages over the data used in these previous studies. First, the survey data includes the entire set of college applications, outcomes, and college choices of the students in the sample; we also have information about why some students did not apply to certain selective colleges such as University of Virginia. Second, the survey data quantifies the preferences of each applicant, as well as identifying their attitudes toward risk and borrowing, their information about financial aid/tuition, their college search process, and their investments in application preparation. While our analysis does not offer direct causal evidence about how particular policy interventions would change outcomes, it does provide guidance about specific targeted interventions designed to narrow the gaps in college choice.

The richness of our survey data allows us to investigate three distinct hypotheses that can explain the differences in application patterns and college choices between high-income and low-income students. First, we find that low-income and high-income students with similar academic qualifications have similar admission probabilities at highly selective colleges (e.g. University of Virginia); this finding enables us to reject the

hypothesis that differences in admissions probabilities drive differences in application patterns for highly qualified low-income and high-income students. Second, we find that the low-income and high-income students report similar plans for post-secondary education and are similar in the priorities that they place on a variety of characteristics of different colleges. In particular, though low-income students are more likely to report that it is important to attend a college close to their parents' homes, this difference in geographical preferences is relatively small. In the aggregate, we find only limited evidence that differences in preferences between low-income and high-income students can explain differences in their application patterns and college choices. Third, we find that low-income students have less information and guidance through the application process than do high-income students and we find that this lack of information is closely connected to application choices of low-income students in the study. That is, we find evidence in support of the hypothesis that differences in college choices between low-income and high-income students represent a market failure due to lack of information.

The paper proceeds as follows. Section 2 presents a theoretical framework for understanding optimal application behavior. Section 3 describes our survey methods and data in the context of the Virginia post-secondary education market. Section 4 presents empirical results that compare the application behavior, admissions outcomes and college choices for high- and low-income students. Section 5 summarizes our findings and discusses possibilities for future research -- including additional survey work, secondary data analysis and random assignment trials of particular policy interventions -- to assess how students from different circumstances negotiate the college choice problem and whether modest policy interventions may serve to reduce market failure in this process.

2. Theoretical Background: Application Choice as a Portfolio Problem

Choosing where to apply to college is a difficult problem in both theory and practice. The College Board recommends a set of five to eight applications, though emphasizing that there is "no magic number" of applications; it encourages students applying to selective schools to apply to a portfolio of colleges that include "Reach", "Possible" and "Safety" schools.[5] Quoting one admissions professional, the College Board goes on to encourage students to "Make an informed forecast by studying the admissions process, the colleges, and, most importantly, yourself . . . Plan on investing time and effort as you probe, question, and evaluate. Use your resources; seek insight from those you know."[6] However, this approach may be quite novel to low-income students, particularly those who do not have access to experienced guidance counselors or friends who have applied to selective colleges in the past.

To provide a simple example of some of the considerations involved in the "Application Choice" (or portfolio) problem for student applications, consider a theoretical model where there are three categories of colleges in terms of selectivity; highly selective colleges, moderately selective colleges, and non-selective colleges.[7] Suppose further that the unconditional admission probabilities for highly-qualified students at these colleges are $\mathbf{p_H} < \mathbf{p_M} < \mathbf{p_N} = 1$, with corresponding utilities $\mathbf{u_H} > \mathbf{u_M} > \mathbf{u_N} > 0$. Finally, suppose that the cost of an application is **c** in utility units.

[5] Several recent papers provide a theoretical foundation for this portfolio approach to college applications. See, for example, Lien (2007a), Lien (2007b), Chade and Smith (2006), Chade, Lewis, and Smith (2006).

[6] See http://professionals.collegeboard.com/guidance/applications/how-many.

[7] See Howell (2004) and Pallais (2008) for discussions of related, but more general models.

In this context, it is straightforward to compute the incremental utility values for the first application submitted: $\mathbf{p_H u_H}$ for a college in the most selective category, $\mathbf{p_M u_M}$ for a moderately selective college and $\mathbf{u_N}$ for a non-selective college (i.e. a safety school). A student with an exogenous constraint that limits her to at most one application should choose an application corresponding to the maximum of these three incremental values ($\mathbf{p_H u_H}$, $\mathbf{p_M u_M}$ or $\mathbf{u_N}$), assuming that this incremental utility value is greater than the cost **c** of an application. Note that even this simple, highly constrained choice problem requires a substantial amount of information to evaluate the probabilities and the match quality of attending each college.

Identifying an optimal portfolio of more than one application is a quite complicated problem, even in the simple framework of our example. There are two effects at play. First, a marginal application (beyond the first) contributes an increment to expected utility that depends on the combination of other applications. Second, the incremental value of each additional application to a given type of college depends on the correlation between admissions decisions for that type of college. If, for example, the admissions outcomes at highly selective colleges are highly correlated for a particular student (e.g. the student is either admitted at all of the highly selective colleges where she applies or none of them), then there is little reason for that student to apply to more than one of them.[8] The combination of these two factors produces an unwieldy theoretical problem that seems to defy attempts at rule-of-thumb simplification.[9] The problem is

[8] If admissions offices observe idiosyncratic factors about applicants from their applications that affect their attractiveness (but unobservable to the applicants themselves) at all colleges, then admissions decisions within a given type of college will be positively correlated.

[9] In fact, a "greedy" algorithm may not identify the optimal choice of multiple applications. For example, it is possible that it is optimal to apply to a moderately selective college if constrained to a single application, but to a combination of most selective and non-selective college if allowed two applications.

further complicated by the opportunity to apply Early Decision at some colleges, which generally increases one's probability of admission, but requires a commitment to enroll if admitted.

A. General Properties of an Optimal Application Portfolio

For the purpose of this paper, we can identify some intuitive properties of optimal application portfolios. We refer to these properties later to assess the application patterns of students that we observe in our empirical analysis.

Theoretical Property 1: Assuming minimal costs per application (i.e. a relatively low value of **c** by comparison to $\mathbf{u_H}$ and $\mathbf{u_M}$), it should be optimal to apply to a number of colleges rather than to just one or two.

Theoretical Property 2: Assuming substantial correlation between admissions decisions among colleges of a given level of selectivity, it will generally be optimal to apply to colleges of different levels of selectivity rather than to concentrate on applications to a number of colleges of similar selectivity.[10] Thus, the rule-of-thumb suggested by the College Board, applying to schools in each category ("Reach", "Possible", and "Safety"), should provide a reasonable approximation to the theoretical solution to the portfolio problem.

[10] Note that the optimal number of applications increases as more levels of selectivity are introduced or when additional dimensions are added such as the distinction between schools specializing in engineering and liberal arts.

B. Possible Explanations for Differing Application Choices by Income

Our theoretical framework also suggests three distinct hypotheses that predict differences in application behavior between high-income and low-income students with similar academic qualifications. Each student's college choice problem is characterized by two sets of parameters: admissions probabilities $\mathbf{p_j}$ and utilities for attending specific colleges $\mathbf{u_j}$. Further, each student's optimal application portfolio can be identified as the solution to a complicated mathematical problem where this solution is a function of the paramters ($\mathbf{p_j}$, $\mathbf{u_j}$). There could be systematic differences in application behavior for two groups of students if these groups have systematically different parameters for the problem (either the **p**'s or the **u**'s could be different for the two groups) or if one group is simply better at solving the optimization problem than the other. We elaborate on each of these possibilities below.

Hypothesis 1 ("Different Admission Probabilities"):

The selection criteria for participation in the study ensure that high-income and low-income participants have similar standardized test scores, but it is still possible that the high-income students in the study have systematically higher probabilities of admission at selective colleges.[11] Such differences in admission probabilities could arise if the selective colleges discriminate against low-income students in admissions, or if the high-income students in the study are more attractive from an admissions standpoint than the low-income students in ways that are not captured by their test scores. If there are

[11] On a national level, Bowen, Kurzweil and Tobin (2005) find that the admissions policies of selective colleges and universities appear to be income-neutral - family income has no predictive effect on admissions decisions for applicants with similar academic qualifications. But we do not know if this finding extends specifically to colleges within Virginia.

differences in admission probabilities for high- and low-income students with similar academic qualifications, they could induce differences in the optimal number of applications for each group. applies specifically to colleges within Virginia.[12]

Hypothesis 2 ("Different College Preferences"):

The high- and low-income students in the study may have systematically different college preferences. One common conjecture is that low-income students are more anxious than high-income students to attend colleges close to their parents' homes, even if this preference limits college options to less selective institutions. A related conjecture is that low-income students perceive that they will not fit in well at highly selective institutions, even including state flagship public institutions, and thus would receive lower utility than high-income students from attending such institutions.

These first two hypotheses suggest that any difference in application patterns for high-income and low-income students could be economically rational. If the parameters of the college choice problems differ for the two groups then the solutions to their optimization problems should also be distinct. The third explanation takes the opposite view that differences in application patterns between high- and low-income students in the study represents a market failure.

[12] Note however that it is also possible that differences in admissions probabilities could make it optimal for low-income students to apply to a larger number of selective colleges than high-income students. For example, a high-income student who is nearly certain of admission to (say) a medium-selective college has less incentive to apply to multiple colleges of that level of selectivity than a low-income student if the low-income student has a substantially lower probability of admission to medium-selective colleges.

Hypothesis 3 ("Informational Differences"):

The high- and low-income students may differ systematically in sophistication and understanding of the college admissions process. Thus, students from relatively disadvantaged backgrounds may simply lack information necessary to respond optimally to the application choice problem. For example, low-income students may not have social networks that would enable them to assess the likelihood of admission and potential match quality of different collegiate options.[13] Even more concretely, low-income students may either not know or may systematically overestimate the net costs for some colleges. By contrast, students from more advantaged circumstances are likely to receive first-hand information about different colleges and cogent advice – from sophisticated counselors, peers or parents - that closely tracks the solution to this type of portfolio choice problem.

3. Data, Sample Selection, and Methodology

We surveyed high-achieving students and their parents from the state of Virginia in the fall of 2007 to understand their initial collegiate aspirations, expectations about financial aid, the colleges and universities to which they planned to apply and other considerations about college choice.[14] The fall survey included a set of probabilistic questions about perceived chances of admission to a range of institutions as well as a series of questions about college costs, the availability of financial aid, and willingness of

[13] Similarly, Avery, Fairbanks and Zeckhauser (2003) found that among students attending Harvard, MIT, Princeton, or Yale, less than half of the students who attended high schools that rarely send graduates to out-of-state selective institutions understood the details and rules of early application programs.

[14] The full surveys are available at: http://people.virginia.edu/~set5h/aaa.html.

students and families to borrow to finance college attendance. We conducted a follow-up survey with the same students in May 2008 to learn about their college outcomes – where they were admitted and rejected, what financial aid packages they were offered, and what colleges they chose to attend.[15]

Our survey frame started with the pool of 10,385 high school seniors in Virginia with SAT or PSAT test scores between 1200 and 1400 from the Search File of the College Board as observed in the fall of 2007. Other empirical work has shown that it is just outside the very top range of achievement test scores where the largest gaps by family circumstances appear in college search (Pallais and Turner, 2006). This range is consistent with the interquartile range of matriculants at highly selective public universities including the University of Virginia (1220-1430), William and Mary (1240-1440) and the University of North Carolina at Chapel Hill (1200-1390).

Our primary concern in selecting the sample was to achieve sufficient income diversity to support a comparative analysis of high-income vs. low-income students. Because we did not have access to direct measures of the household income of the students in the College Board sample we employed information about students' addresses to estimate family income. Using those addresses and data from the Census Bureau we matched each student to the median household income in their Census block group.[16]

[15] To refine our survey instrument, we recruited 15 high school seniors from Charlottesville and Albemarle County who came to the CSR with their parents to test preliminary versions of the parent and student surveys and to participate in an associated focus group. We revised the set of questions in response to detailed feedback provided in focus group discussions.

[16] Of the initial group of 10,385 students, 678 were predicted to be from families with income less than $40,000 based on the Census block information associated with their address. We sampled this projected low income group at a rate of 50%.

Stratifying on predicted income, we sampled 1,100 student-parent units to receive the survey.[17]

Of the sample of 1,100 possible participants, a total of eight individuals were discovered to be ineligible to participate. Seven had moved out of the state and one had to repeat senior year. There were fifteen bad mailing addresses. With those adjustments made, a total of 1077 individuals were eligible to complete surveys. We received 618 completed parent surveys (57.4% of 1,077) and 544 completed student surveys (50.5% of 1,077). There were 39 refusals (3.6% of 1,077), and the rest of the individuals, a total of 420 invited to participate, did not respond (39.0% of 1,077). In turn, we received responses from 476 students in the spring survey, representing 92% of our first round student respondents.

We find no differential non-response on the basis of predicted family income or other student characteristics observed in the College Board file. Nevertheless, a substantial concern is that students and parents who responded to our survey are differentiated from non-respondents in ways that are correlated with more general investments in the college search process. For example, those families most sympathetic to academic researchers or engaged by a survey on the college choice process may also be those who have invested the most in college search and plan to apply to a broad portfolio of colleges. Such effects would, in general, produce more ambitious application patterns in our sample than in the underlying population. Because we do not observe

[17] Following standard IRB guidelines, since many student participants were under the age of 18 we first sent surveys and consent forms to parents. Then, after receiving parental consent, we sent surveys to students. We offered compensation of $25 to parents and $20 to students for survey completion, estimating each survey would take approximately 30 minutes to complete. We sent out several reminder postcards and conducted reminder phone calls to potential subjects in order to maximize the response rate. We also made the survey available online for those students and parents who find this mode of response more convenient.

substantial differences in expected income by response status, our expectation is that potential bias is not differential by family circumstances.

We use the state of Virginia as a platform for our analysis because Virginia's college system is representative of that of other states in many important ways. First, an overwhelming majority of students entering college throughout the United States choose to attend college in their state of residence. In Virginia, approximately 81% of first-time college freshmen attend college in-state.[18] Second, as Courant, McPherson, and Resch (2006) note, nearly all states have some version of a stratified system of higher education in which there are multiple "tiers" of public higher education, typified by "flagship universities," state college campuses, and community colleges. Virginia matches the description, offering 15 public four-year institutions and 24 two-year or community colleges,[19] with substantial differences in selectivity, resources per student, areas of specialization, graduation rates, and availability of financial aid among the four-year public colleges. Figure 1 demonstrates marked differences in cohort graduation rates within the set of four-year public colleges. The two nationally-ranked public universities (University of Virginia and the College of William and Mary) report six-year graduation rates over 90%, while other public four year-institutions struggle to graduate more than half of entering students in six years.[20]

[18] See *Digest of Education Statistics* (2007), "Table 213. Residence and migration of all freshmen students in degree-granting institutions, by state or jurisdiction: Fall 2004." Nationally, this measure is 83%.

[19] See http://www.schev.edu/Students/PublicCollegeList.asp for a list of these public institutions in Virginia.

[20] Of course, these outcomes are related to the characteristics of students at the point of enrollment. Still, while median SAT scores among entering students at the University of Virginia (medians of 680 Math and 660 Verbal) are, for example, appreciably higher than those at a school with lower graduation rates like Old Dominion University (medians of 540 Math and 520 Verbal), there is evidence that conditional on academic achievement, completion rates are higher at the selective schools in the state (Bowen, Chingos, McPherson 2009).

Descriptive sample characteristics

Table 1 presents the baseline descriptive characteristics for our sample respondents distinguished by broad family circumstances. Among the students who completed both fall and spring surveys, students from families with incomes of at least $75,000 ("high income students) and students from families with incomes less than $75,000 ("low income students) have broadly similar SAT scores. High-income students did have SAT math test scores that were an average of 12 points higher than low-income students; this difference in SAT math scores was significant at the 10% level but not at the 5% level. In addition, low-income students reported taking significantly fewer AP courses than high-income students, but were more likely to rank in the top decile of their graduating class. This suggests that the low-income students we sample tend to be standouts in high schools with relatively few comparable peers, which would be natural if high school students are somewhat segregated by family income.[21]

Table 1 also demonstrates that there is substantial positive correlation for students in the study between each of three different measures of possible disadvantage: (1) reported family income; (2) parental education attainment; (3) college matriculation rates for the high schools of the students in the survey. Low-income students (defined for the purpose of this analysis to include those with family income reported by parents to be less than $75,000 per year) in the study were more than three times as likely as high-income students (family income reported by parents to be $75,000 per year or more) to come from households where neither parent graduated from college, while high-income

[21] One confounding factor for this interpretation is that the high-income students were ten percentage points less likely to know their class rank, suggesting that they attend high schools that either suppress or do not publicize class rank, possibly for the purpose of improving college outcomes for their graduates.

students were almost twice as likely as low-income students to come from households where both parents had college degrees. Each of these differences was significant at the 1% level.

Some differences in outcomes may be linked to high school characteristics and the extent to which college going and application to selective institutions is a norm. We collected additional data about college matriculation rates for each of the public high schools in Virginia from the Virginia Department of Education website[22] and we also compiled data from the University of Virginia Admissions Office on historical application and admission data by high school. Restricting attention to those students attending public schools in Virginia (for which we have college matriculation rates), high-income students attended high schools with an average nearly twice as many graduates admitted to the University of Virginia and with overall college matriculation rates nearly 10 percentage points higher on average than low-income students. Each of these differences based on income is significant at the 1% level.

Given the substantial correlation between each of three different measures of disadvantage, we focus on just one of these measures – reported family income – for expositional simplicity in the remainder of the paper.

4. Collegiate Outcomes and Application Choices

College enrollment is a function of three sequential choices: students apply, colleges and universities make admissions decisions and then students make matriculation decisions. We begin with the final outcome: the choices made by students

[22] To avoid any overlap between high school data and the choices of students in our data, we compiled high school data from the previous school year, 2006-2007.This information is available at http://www.doe.virginia.gov/VDOE/Publications/grads/grad0607.html.

and then present evidence on the intermediate focus. As we have foreshadowed, our focus is on the application choice of students as this is the choice at which differences by socio-economic status are the largest. We use the Barron's selectivity rankings to compare the types of colleges chosen by students.[23] The Barron's classifications are primarily based on admissions selectivity and the composition of entering classes at these colleges, with rankings proceeding in descending order from "Most Competitive" to "Community College".

As a descriptive starting point, Figure 2 provides a clear sense of the differences in college choice by family circumstances. In their responses to our final survey, low-income students were more than 9 percentage points more likely to report plans to matriculate at one of the Barron's schools in the top selectivity category ("Most Competitive") and more than 26 percentage points more likely (86.4 versus 61.4 percent) to plan matriculation at a school ranked "Very Competitive" or above.[24] One key difference between the two groups of students is that high-income students were more likely to plan to matriculate at University of Virginia and William and Mary (26.1% of high income students and 17.4% of low-income students in the survey planned to enroll at these two colleges), the two public colleges ranked by Barron's as "Most

[23] Barron's *Profiles of American Colleges* presents a taxonomy of colleges in terms of selectivity as measured by entering students' class rank, high school grade point average, average SAT scores, and the percentage of applicants admitted. In addition to a separate category for community colleges, we record students at schools classified as "Competitive", "Very Competitive", "Highly Competitive", and "Most Competitive." In our sample, schools in each category include: Virginia Commonwealth University and Old Dominion University (Competitive), James Madison and Virginia Tech (Very Competitive), University of Mary Washington (Highly Competitive) and University of Virginia and College of William and Mary (Most Competitive).

[24] More than 10% of the low-income students had not chosen a college when they completed their surveys. Among these students, only two were admitted to a "Most Competitive" college (one to University of Virginia and one to William and Mary), and only one additional student was admitted to a "Highly Competitive' college (University of Mary Washington). That is, the college choices of these students are unlikely to substantially affect the comparisons between high-income and low-income students in Figure 2.

Competitive". By contrast, low-income students were much more likely to enroll at less selective public institutions such as Old Dominion and Virginia Commonwealth, which also have four-year graduation rates below 25%.

These observed differences in matriculation outcomes have their roots in the application stage of the college choice process. Figure 3 shows the distribution of students by income and the most selective application; the top panel considers the most selective application among all applications and the bottom panel presents the most selective application among the public colleges and universities in Virginia. Overall, the most selective institution in a student's application set is about 20 percentage points more likely to be a "Most Competitive" or "Highly Competitive" institution for a high income student than a low-income student.[25] While low-income students are somewhat more likely to apply to at least one in-state college or university (90.2% relative to 80.5% for high-income students[26]), the rank of their most competitive choice is likely to below that of their more affluent peers. For the two most selective public institutions in the state, there are substantial differences in application rates by family circumstances. While about 47% of high income students in our sample apply to the University of Virginia, the share applying among low-income is about 29%. The difference in application rates to William and Mary is smaller (29.5% for high income relative to 25.2% for low-income) though nevertheless substantial.

[25] Notably, these basic differences are not sensitive to differences in family income associated with covariates. Estimating an order logit with the ranked Barron's categories as the dependent variable and test scores, demographics and high school grades as covariates yields an odds ratio on the low-income variable of .4386 (.1000), underscoring the substantial difference by family circumstances.

[26] When we focus on those who did not choose a college through an early decision program, low-income students apply to an in-state institution at a rate of 93% relative to 84.4% for high-income students.

Early Decision complicates the analysis of application portfolios, since by rule, Early Decision admits only apply to a single college. For this reason, we restrict much of our analysis to students who were not committed to a college as early admits.[27] Our separate analysis of early application patterns suggests that high-income students are substantially more ambitious than low-income students in their choices of early applications. Table 2 shows that high-income students are about 10 percentage points more likely to apply early (52.6% versus 43.1%) than low-income students. Conditioning on early admission, high-income students are approximately five times more likely than low-income students to attend a "Most Competitive" college.

Examining the application choices of the remaining students applying through the "regular" application timeline, Figure 4 shows the differences in total number of applications (the difference between the two groups is an average of about ¾ of an application). One striking point from Figure 4 is that low-income students apply to more institutions in the "competitive or less" tiers than their high income counterparts. Turning to the bottom panel of Figure 4, these differences are strikingly consistent among applications to public colleges and universities in Virginia.

To frame students' application choices in terms of their own perceptions of a college's "match" to their own academic credentials, we asked each respondent to rank choices in terms of "reach, match and safety". In Figure 5 (top panel), we then tabulated the distribution of responses in terms of whether students applied to a full portfolio

[27] We classify students as "early admits" if they were admitted early and reported applying to only one college. Some of these early admits were admitted to colleges offering "Early Decision", thereby committing to enroll if admitted. Others were admitted to colleges offering "Early Action", so that they could then have applied to other colleges, but did not do so. Note that while the University of Virginia eliminated early decision beginning in 2008, both William and Mary and Virginia Tech maintained early decision programs. James Madison University offers a non-binding early action program.

("Reach, Match and Safety") corresponding to the prescriptive advice from the College Board (described in Section 2) or whether they pursued a more limited strategy (such as "Match and Safety"). High income students are 16 percentage points more likely to pursue some form of the "Reach, Match and Safety" strategy than their low-income peers. In turn, low-income students are about 14 percentage points more likely to pursue a strategy which includes applications to only safety schools. In terms of application counts (bottom panel of Figure 5), low-income students complete appreciably fewer "reach" and "match" applications while actually submitting more safety applications than their high income peers.

Given the observed differences in application choices, our approach is to assess the extent to which these differences in applications by family circumstances are the result of rational optimization or whether they represent market failures. We consider the applicability of each of our three main explanatory hypotheses from Section 2 to these findings in turn.

Hypotheses explaining differences in application behavior

Differences in admissions probabilities

Table 3 presents admission rates conditional on application for the three most selective public schools in Virginia – the University of Virginia, the College of William and Mary, and Virginia Tech. We present both the raw admissions probabilities and the coefficients on income from a regression with covariates for pre-collegiate achievement (SAT scores). In each case the unconditional differences in the likelihood of admission, as well as the differences conditional on test scores from a linear probability regression, are indistinguishable from zero.

For students making decisions about applications, the salient issue is the expectation that students hold about the likelihood of admission. In the fall survey, we asked about the likelihood of admission to specific in-state universities, as well as out-of state options, asking for a choice among "Likely", "50/50", or "Unlikely"; a response indicating insufficient knowledge to answer the question was also possible. A similar question was asked for students and parents, with responses recorded in panels A and B of Table 4. While parents tend to be somewhat more optimistic about admission probabilities than students overall, there are few differences by family circumstances in the distributions of expected outcomes. To some degree, low-income students and their parents actually overestimate the likelihood of admission to the University of Virginia; such differences – while not significant – run counter to the hypothesis that low-income students are less likely to apply to the University of Virginia because they underestimate the likelihood of admission.[28]

Differences in Preferences

To assess the broad college preferences of individual students, we consider their responses to survey questions about long-term educational plans, the relative importance of many different aspects of the collegiate experience, and their reported reasons for *not applying* to particularly salient colleges. We asked students (and their parents) to rank a set of 21 different aspects in importance for "choosing a college or university to attend." These queries included qualitative dimensions of the academic experience (small classes,

[28] It could be argued that differences between perceived and actual probabilities of admission represent an informational problem that should be excluded from a rational theoretical model and classified as a market failure. But this distinction is moot for our analysis because we find essentially no difference in either actual or perceived admission probabilities for low-income and high-income students.

U.S. news ranking), peer characteristics (political, racial and socio-economic peers and diversity), and factors related to geography and cost of attendance. We also asked students about their plans for long-term educational attainment

The responses of high-income and low-income students indicate that both groups of students have ambitious educational goals and place similar importance on academic quality in their choices of colleges. As shown in Figure 6, over 62% of students from both income groups aspire to complete an advanced degree (top panel Figure 6). Among parents, 93% of both income groups expect their students to complete a BA.[29] Similarly, about 90% of students in both income groups respond that "academic quality" is a very important factor in choice of college.

In terms of preferences for peers, similar (and small) percentages of high-income and low-income students report that it is very important to attend a college with a large number of students of the same race, economic class, or political beliefs. High-income and low-income students also produced similar patterns of responses to questions about the importance of racial and economic diversity in a college's student body. We take these responses as a strong rejection of the hypothesis that differential collegiate choices associated with socio-economics characteristics are associated with different "tastes" for peers or academic quality.

We do observe some differences between the two groups in their preferences for (1) social aspects of college life; (2) cost of college; (3) geography. In terms of social life, a larger percentage of high-income students reported that "Quality of Social Life" and "Strong Reputation of Athletic Programs" were very important aspets of colleges.

[29] One difference between the groups is that high income parents are somewhat more likely to expect professional degree completion and low-income parents are somewhat more likely to expect doctorate degree attainment (Figure 6, Panel B).

This difference in preferences would suggest that the high-income students would be more likely to enroll as less-selective colleges with (presumably) more emphasis on social life and less emphasis on coursework, and thus cannot explain the observed pattern of outcomes where low-income students are less likely to apply to and to attend highly selective colleges.

Not surprisingly, the low-income students emphasized the importance of financial aid, with over 60% of respondents rating the availability of financial aid as "very important." Yet, as we discuss in more detail below, concern about financial aid availability should not be a limiting factor in the determination of a student's application set and, indeed, there may be a persuasive case to make for students with the greatest concern about college costs applying to more rather than fewer schools. Further, low-income students seeking high quality academic programs at low cost have very strong incentives to apply to the University of Virginia and the College of William and Mary, given their very generous grant programs specifically targeted at these low-income students.

We find modest differences between the two groups of students in geographic preferences. About 5.7% of low-income students relative to about 1% of high-income students said that "Living at Home" was an important factor in their college choices. Similarly, low-income students were about 1.5 times as likely as high-income students to say that "living *away* from home" was not important, while high-income students were about 1.5 times as likely to say that "living *away* from home" was a very important factor in college choice.

To connect these difference in financial and geographic preferences to college application decisions, we asked students in the spring survey to identify the main reasons that they did *not apply* to 11 prominent colleges in Virginia.[30] We are particularly interested in reasons why students did not apply to the University of Virginia and to William and Mary since these are the two in-state public colleges with "Most Competitive" ranking and since a much higher percentage of high-income than low-income students applied to them.

Approximately 75% to 80% of students who did not apply to each of these two colleges indicated just one reason for this choice, and we tabulate their responses in Table 6. The only conspicuous difference in responses between the two groups is that high-income students were more than twice as likely to indicate that they did not apply to the University of Virginia because they did not think that they would be admitted.[31] Only a very small number of students cited expenses or distance from home as the primary reason for not applying to either college. This suggests that finances and geographic preferences – the only categories where we observe systematic differences in Table 5 that could explain why low-income students are relatively unlikely to apply to highly selective colleges – have only minor influence on the application decisions of the two groups of students.

One caveat to the analysis of responses listed in Table 6 is that a majority of students indicated that the primary reason for not applying to each college was that they were "not interested" in attending. This open-ended and broad response encompasses a

[30] In almost every case where a student did not apply to one of these colleges, the student checked at least one of the six reasons in the list that we provided.

[31] Interestingly this pattern of responses suggest that perceived differences in admission probabilities would cause low-income students to be more likely rather than less likely than high income students to apply to the University of Virginia.

wide range of possibilities and could well mean something different for each of the two groups of students. With this caveat, these responses provide little support for the conjecture that differences in preferences between the two groups of students can explain the differences we observe in application choices by socio-economic circumstances.

Lack of Information

An alternative hypothesis to explanations for application differences driven by differences in expected admission probabilities or preferences is that students (and parents) lack information to navigate the application process and choose among specific colleges in the application stage. Three sources of direct evidence in the surveys address the question of whether low-income students are relatively poorly informed about important elements of the college application and admissions process. We evaluate evidence on the extent to which self-assessments of students and parents indicate knowledge about the process, the extent to which students and parents are able to correctly forecast net cost, and indicators of knowledge of peer attendance as indicators of understanding of institutional context. We are interested, first, in whether there are substantial differences by family circumstances in these indicators and, secondly, in the extent to which such observed differences are related to application choices.

First, we included survey questions for both students (fall and spring surveys) and parents (fall only) to elicit their self-assessments of "how well informed do you feel about the college application process," offering response choices form "not at all" to "very." As shown in Figure 7, high-income students were about 1.5 times as likely as low-income students to report that they were "very well informed" about college admissions in

responses to each survey. Similarly, high-income parents were about twice as likely as low-income parents to report that they were "very" well informed about college applications. Notably, high income students gain somewhat more between fall and spring more – an increase of 16.8 percentage points relative to 13 percentage points --in the share claiming to be very well-informed about the application process.

Students who responded that they were "very" well informed applied to a greater number of colleges and more highly selective colleges, on average, than students who did not believe that they were "very" well informed. Table 7 presents logit estimates where the dependent variable is an indicator for applying to at least one "most competitive" school; the baseline specification includes controls for student achievement in addition to the income measure. [Appendix Table 1 and Appendix Table 2 present similar results for other outcomes including number of applications using Poisson specifications for the count outcome.] The coefficients on indicator variables for whether the student (and parent) indicated that they were "well-informed" about the college application process are positively related to the application outcome and, in turn, lead to a reduction in the point estimate of the low-income coefficient (Table 7, column (2)). While such evidence is indicative that information barriers may lead to differential application outcomes among students, we are particularly interested in identifying the nature of information deficits, distinguishing between knowledge of college opportunities and knowledge of the cost of college.

Understanding aid availability

To measure knowledge of financial aid we asked about familiarity with the tools of the financial aid such as the FAFSA, Pell grants, and so forth and we asked about

perceptions of posted and net costs for different types of colleges. In the main, low-income students and their parents demonstrate familiarity with the broad process of applying for financial aid, as only about 16.5% of students and 16.8% parents indicate a lack of familiarity with the aid application process (Figure 8). While parents demonstrated broad knowledge of Pell programs, students were much more likely to respond that they were unfamiliar with the Pell grant program. Students and parents were overwhelmingly unfamiliar with Virginia-specific programs such as AccessUVa and TAG.[32] Using these broad indicators such of familiarity with the aid process as predictors of application behavior yields imprecisely estimated effects of the expected sign (Table 7, column (3)).

How the availability of financial aid affects college application decisions depends on the extent to which students and their parents are able to correctly estimate net college costs. In the fall, we asked both students and parents to estimate total cost of attendance (including tuition, room, and board) and the expected amount a student of modest means (defined as family income of about $40,000) would need to pay after receiving financial aid for attendance at specific institutions – the local community college the University of Virginia, Virginia Commonwealth University and Princeton University. Possible responses were included intervals of $5000 from 0-$5,000 to over $50,000, in addition to a "Don't Know" option. A primary concern is that students and their families may choose not to make applications because they systematically overestimate "net cost", assuming that institutions with high posted prices will also be the most expensive for

[32] AccessUVa is the program adopted by the University of Virginia in 2004 to increase affordability for low-income students; the University launched a substantial public information campaign to disseminate information about the program. TAG is the "Tuition Assistance Grant" funding by the state for students attending in-state private universities. Strikingly, it was much more common for high-income parents than low-income parents to report familiarity with Access UVa.

students with financial need. Total costs of attendance at these institutions for 2009-10 are $14,239 at the community college (for a student living away from home), $18, 452 at Virginia Commonwealth University, $21,480 at the University of Virginia and $50,620. For low-income students, expected cost of attendance is reduced by available financial aid. For low-income students attending a Virginia community college, the primary source of grant aid will be federal Pell grants, which have a current maximum of $5350. For students attending the University of Virginia and Princeton University, substantial institutional grant aid dramatically reduces the net cost of attendance for low-income students as both institutions meet full need and have replaced loans with grants for low-income students. Thus, the true expected net costs of attendance is less than $5,000 at both the University of Virginia and Princeton, which is appreciably less than the expected net cost at either a Virginia community college or an institution live Virginia Commonwealth University.

Table 8 shows how students and parents evaluate the net cost of attending these institutions for the hypothetical low-income student. Whereas the net cost of attending the University of Virginia for a student with family income of $40,000 would typically be $3,000 or less, only 15% of low-income students chose the lowest bin ($0 - $5,000) for this net cost, and 13% of them chose "Don't Know." These low-income students similarly overestimated the net cost of attending Princeton. By contrast, 33.3% of low-income students estimated the net cost for Virginia Commonwealth University as less than $5,000 and 42.7% estimated the net cost between $5,000 and $10,000, when the true net cost is expected to be somewhat higher. Patterns for parents were broadly similar,

with a somewhat higher fraction of low-income parents responding that they didn't know the expected net cost.

To gauge the extent to which misperceptions about net cost and financial aid ability translate to application behavior, we included indicators for overestimation of net college costs at the University of Virginia and Princeton in the regressions predicting application to a most selective college (Table 7, columns (4), (5) and (7)). The results are striking: those students who either dramatically overpredict net cost or do not know net costs are significantly less likely to apply to the selective colleges and universities. While these results are not strictly causal, they are certainly consistent with the hypothesis that student and parent lack of information about net cost is an impediment to completing a full portfolio of applications.

Familiarity with different collegiate institutions

We asked a series of questions to assess the peer and social networks of survey respondents with respect to information about different colleges. Note that while high school contacts may be the primary channel for meeting students attending different colleges, high school students meet future college students through a variety of other channels including family, community groups, and extracurricular activities. Table 9 demonstrates significant differences in peer networks for high-income and low-income students. To illustrate, high income students are appreciably more likely than their low-income peers to know someone attending the University of Virginia (86.9% relative to 64.2%) and College of William and Mary (72.3% versus 57.7%). More generally, high income students are also consistently more likely to report knowing students attending

research universities and liberal arts colleges. These differences in student contacts are, in turn, strongly correlated with application outcomes (columns (6) and (7) of Table 7).

Our preferred interpretation of these results is that these systematic differences in social networks cause high-income students to be simply better informed than low-income students about their selective college options. But we recognize the plausibility of an alternative interpretation that such peer effects are endogenous and are strongly linked to family and school characteristics that are not captured in our simple measure of family circumstances. That is, low-income students may lack connections to students at highly selective colleges because they lack interest in those highly-selective colleges; it is also possible that low-income students infer that social connections provide a signal about "college match" – so that those without connections at highly-selective colleges conclude that they would not be welcome or happy at those colleges.

Section 5. Conclusions and Next Steps

Our evidence provides a clear indication that differences in knowledge about financial aid and collegiate options are a primary determinant of the divergent application outcomes for students from different socio-economic circumstances. That information constraints, rather than preferences or the likelihood of admission, are primary in explaining socio-economic differences in application behavior points to a market failure in the matching of students to collegiate opportunities. Of critical importance, high-income and low-income students in the study report similarly ambitious plans for graduate work, but the low-income students are disproportionately unlikely to enroll at

colleges with relatively low graduation rates – these colleges are probably not the best choices to prepare for success in graduate school.

These results suggest that there is merit in investigating the extent to which efforts to change what students know about the application process and the full range of college options may narrow differences in applications, and more importantly, college choice between students from different economic circumstances. While our informational indicators are powerful explanatory variables, surveys alone do not allow us to distinguish whether these measures are indicative of deeply-seated differences generated by high schools and families or whether modest policy efforts to change the knowledge base of high school students about college options will alter student approaches to the application decision.

In considering how students acquire information about the college application process, a common proposition is that low-income students and students attending high schools where application to selective schools is not the norm get insufficient guidance. Our survey questions probed the extent to which guidance counselors provided information and the degree to which counselors were judged helpful on a number of application dimensions such as suggesting an application strategy, advising about deadlines and so forth. In the main, there were no differences between low-income and high-income students in the number of meetings or the students' assessment of the guidance counselors. This evidence points against the simple hypothesis that the quantity of time devoted by those counselors serving low-income students lags that provided to high-income students, though leaves open the question of whether there are differences in the type or "quality" of guidance received by students from different circumstances.

Certainly more data on the information provided by guidance counselors and how this affects students' application patterns would help in understanding whether counselors might play a more effective role in the college choice process.

To diagnose the differences in application behavior by socio-economic circumstances, our survey measure provides rich description of the steps that students from different circumstances take in the college application process. A range of "process" indicators such as taking the SAT II and applying to a college with a supplemental essay distinguish low-income students from high income students. An unresolved question is whether the barriers to completing these intermediate steps to applying to a selective schools re more formidable for low-income students than their more affluent peers.

Economic researchers bring a wide-range of tools to understand the reasons why socio-economic differences widen appreciably at the transition from high school to college, with these differences likely contributing to differences in attainment. A central contribution of this work is to distinguish among competing hypotheses. We are able to rule out the proposition that differences in admission probabilities explain differences in outcomes, while offering clear evidence that differences in student preferences cannot fully explain differences in college applications. Our results provide clear evidence that how students understand the college application process and, in particular, the expected net cost of college is important to explaining observed differences in choice. Going forward, the combination of further survey work, secondary data analysis and random assignment policy experiments are important research tools to better understand the role of information provision on application behavior and collegiate outcomes.

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Table 1. Descriptive statistics for students participating in fall survey and spring follow-ups of the Aid and Application Awareness Survey

	Family Income $0-$74,999	Family Income $75,000 or Higher
SAT Verbal	658.21	656.36
SAT Math	648.26	658.58
Number of AP Courses	3.08	3.46
Tot 10 Class Rank	55.3%	48.3%
Don't Know Class Rank	14.6%	26.4%
Public HS in Virginia	84.4%	85.4%
Percent HS Grads Attending 4-Year	64.2%	38.0%
Avg # of Students fr HS Admitted to Uva	10.1	20.6
Fewer than 10 students fr HS Admitted to Uva	48.4%	57.7%
Plan Graduate Degree	70.7%	79.0%
Neither Parent Graduated College	34.1%	10.0%
Both Parents Graduated College	38.2%	67.5%
Number of Students	123	329

Notes: Authors' tabulations from Aid and Application Awareness Survey. Percentage of high school graduates attending four-year colleges is only available for students attending public schools. Included observations are respondents to fall student survey, spring student survey, and parent survey.

Table 2. Application behavior and admission outcomes of survey participants

	Family Income $0 to $74,999	Family Incon $75,000 or hig
Early action / decision applications		
Any early application	43.09%	52.58%
Early decision (early + 1 app)	11.38%	13.98%
Type of college early admit		
Community College	7.7%	0.0%
Competitive	30.8%	4.4%
Very Competitive	53.8%	53.3%
Highly Competitive	0.0%	4.4%
Most Competitive	7.7%	37.8%
Application behavior, excluding early admissions with one application		
Applications	4.16	4.93
Admits	2.92	3.37
Applications, Most Competitive	1.56	2.04
Admits, Most Competitive	0.66	0.87
Applications, Not Most Competitive	2.60	2.90
Admits, Not Most Competitive	2.26	2.50

Notes: Authors' tabulations from Aid and Application Awareness Survey.

Table 3. Application and admission to Virginia charter institutions by parental income

	Low Income	High Income	Difference
University of Virginia			
P(Admit | Apply U. Virginia)	0.611	0.656	-0.045
			(0.091)
P(Admit | Apply U. Virginia, Test Scores)			-0.016
			(0.088)
College of William and Mary			
P(Admit | Apply William & Mary)	0.548	0.577	-0.029
			(0.104)
P(Admit | Apply William & Mary, Test Scores)			-0.037
			(0.102)
Virginia Tech			
P(Admit | Apply Va Tech)	0.826	0.848	0.022
			(0.061)
P(Admit | Apply Va Tech, Test Scores)			0.044
			(0.063)

Notes: Authors' tabulations from Aid and Application Awareness Survey.

Table 4. Expectations about admission by family income

Panel A. Student Expectations

	Likely	50 / 50	Unlikely	% No Knowledge
William and Mary				
Income < $75,000	28.8%	54.1%	17.1%	7.4%
Income > $75,000	31.5%	44.5%	24.0%	4.9%
University of Virginia				
Income < $75,000	31.3%	48.2%	20.5%	6.6%
Income > $75,000	23.7%	53.2%	23.1%	3.7%
Virginia Tech				
Income < $75,000	64.6%	31.9%	3.5%	5.8%
Income > $75,000	68.7%	26.8%	4.5%	5.8%
Selective Research University				
Income < $75,000	1.9%	32.7%	65.4%	10.7%
Income > $75,000	1.0%	26.3%	72.7%	7.9%

Panel B. Parental Expectations

	Likely	50 / 50	Unlikely	% No Knowledge
William and Mary				
Income < $75,000	55.2%	33.3%	11.4%	13.2%
Income > $75,000	43.1%	41.1%	15.2%	4.0%
University of Virginia				
Income < $75,000	51.3%	35.7%	13.0%	5.0%
Income > $75,000	40.9%	45.7%	13.4%	2.7%
Virginia Tech				
Income < $75,000	84.1%	11.5%	4.4%	6.6%
Income > $75,000	75.6%	21.5%	2.9%	3.4%
Selective Research University				
Income < $75,000	3.8%	49.1%	47.2%	12.4%
Income > $75,000	6.3%	36.8%	56.9%	10.4%

Notes: Authors' tabulations from Aid and Application Awareness Survey. See question H.1 of fall survey.

Table 5. Aspects of college important to student college choice by socioeconomic status

Low Income (< $75,000)			High Income (> $75,000)		
Not Important	Somewhat Important	Very Important	Not Important	Somewhat Important	Very Important
Financing College					
Low Expenses (a)					
15.6%	56.6%	27.9%	21.6%	61.7%	16.7%
Availability of financial aid (b)					
6.6%	32.8%	60.7%	28.4%	42.0%	29.6%
Academic characteristics					
High Rankings in U.S. News (c)					
34.4%	54.1%	11.5%	33.1%	53.6%	13.3%
Good record in placing job candidates (k)					
3.3%	43.4%	53.3%	7.1%	41.5%	51.4%
Social characteristics					
Quality of Social Life (f)					
12.3%	46.7%	41.0%	4.3%	40.0%	55.7%
Friends plan to attend (m)					
54.1%	41.8%	4.1%	56.0%	40.3%	3.7%
Living Arrangements and Proximity					
Living Away from Home (i)					
27.1%	37.7%	35.3%	17.5%	34.8%	47.7%
Ability to live at home (j)					
77.1%	17.2%	5.7%	90.7%	8.3%	0.9%
Measures of preferences for peers					
Racial diversity (o)					
46.7%	45.9%	7.4%	48.2%	42.6%	9.3%
Being around people of same economic class (t)					
81.2%	18.0%	0.8%	78.5%	21.2%	0.3%
Being around people of same political beliefs (u)					
63.9%	33.6%	2.5%	69.5%	27.7%	2.8%

Notes: Authors' tabulations from Aid and Application Awareness Survey. See question G.2 of fall survey.

Table 6: Main Reasons for Not Applying to Virginia Charter Colleges

	University of Virginia	
	Low Income	**High Income**
Wouldn't Get In	10.8%	22.4%
Too Far From Home	1.4%	0.8%
Wanted a Better School	2.7%	0.8%
Too Expensive	2.7%	0.8%
Not Interested	58.1%	52.7%
Another Reason	24.3%	22.5%
	74	**129**

* This table includes responses from students who did not apply to the University of Virginia and who checked exactly one reason for not doing so.

	College of William and Mary	
	Low Income	**High Income**
Wouldn't Get In	9.2%	11.4%
Too Far From Home	2.6%	0%
Wanted a Better School	1.3%	2.1%
Too Expensive	2.6%	0.5%
Not Interested	76.3%	79.8%
Another Reason	7.9%	6.2%
	76	**193**

* This table includes responses from students who did not apply to the college of William and Mary and who checked exactly one reason for not doing so.

	Virginia Tech	
	Low Income	**High Income**
Wouldn't Get In	0%	2.9%
Too Far From Home	1.7%	0%
Wanted a Better School	6.8%	8.6%
Too Expensive	1.7%	0.7%
Not Interested	74.6%	77.1%
Another Reason	15.3%	10.7%
	59	**140**

* This table includes responses from students who did not apply to Virginia Tech and who checked exactly one reason for not doing so.

Table 7. Logit Regression of "Most Competitive" Application on Information Indicators

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Income < $75,000	-0.480	-0.401	-0.393	-0.453	-0.491	-0.128	0.080
	[0.233]**	[0.237]*	[0.261]	[0.237]*	[0.237]**	[0.253]	[0.290]
SAT Verbal	0.007	0.007	0.007	0.007	0.007	0.007	0.006
	[0.002]***	[0.002]***	[0.002]***	[0.002]***	[0.002]***	[0.002]***	[0.002]***
SAT Math	0.003	0.003	0.003	0.003	0.003	0.002	0.002
	[0.002]	[0.002]	[0.002]	[0.002]	[0.002]	[0.002]	[0.002]
Very Well Informed (Parent)		0.355					0.339
		[0.277]					[0.301]
Very Well Informed (Student)		0.584					0.464
		[0.271]**					[0.287]
No Knowledge FAFSA			0.089				0.189
			[0.270]				[0.292]
No Knowledge FAFSA x < $75k			-0.480				-0.658
			[0.611]				[0.657]
UVa Net Cost $5-10k				-0.279			-0.256
				[0.313]			[0.332]
UVa Net Cost $10-50k				-0.952			-0.904
				[0.337]***			[0.355]**
UVa Net Cost Unknown				-0.738			-0.624
				[0.364]**			[0.389]
Princeton Net Cost $5-10k					-0.275		
					[0.546]		
Princeton Net Cost $10-50k					-0.880		
					[0.420]**		
Princeton Net Cost Unknown					-1.000		
					[0.447]**		
Know Peer William & Mary						0.551	0.541
						[0.254]**	[0.259]**
Know Peer Univ. of Va						0.911	0.909
						[0.311]***	[0.319]***
Know Peer VaTech						-0.602	-0.651
						[0.345]*	[0.356]*
Know Peer Most Sel Lib Art						0.340	0.223
						[0.277]	[0.286]
Know Peer Most Sel Research U						0.069	0.043
						[0.273]	[0.284]
Know Peer Very Sel Research U						0.566	0.589
						[0.289]*	[0.304]*
Constant	-6.817	-6.965	-6.807	-6.194	-5.784	-6.707	-6.226
	[1.807]***	[1.818]***	[1.815]***	[1.865]***	[1.862]***	[1.890]***	[1.971]***
Observations	452	452	452	452	452	452	452

Standard errors in brackets

* significant at 10%; ** significant at 5%; *** significant at 1%

Notes: Dependent variable is a dichotomous indicator equal to 1 if the student applied to at least one "Most Competitive" school. Missing variable indicators and controls for high school class rank are also included.

Table 8. Expectations of College Costs for a Low-Income Family

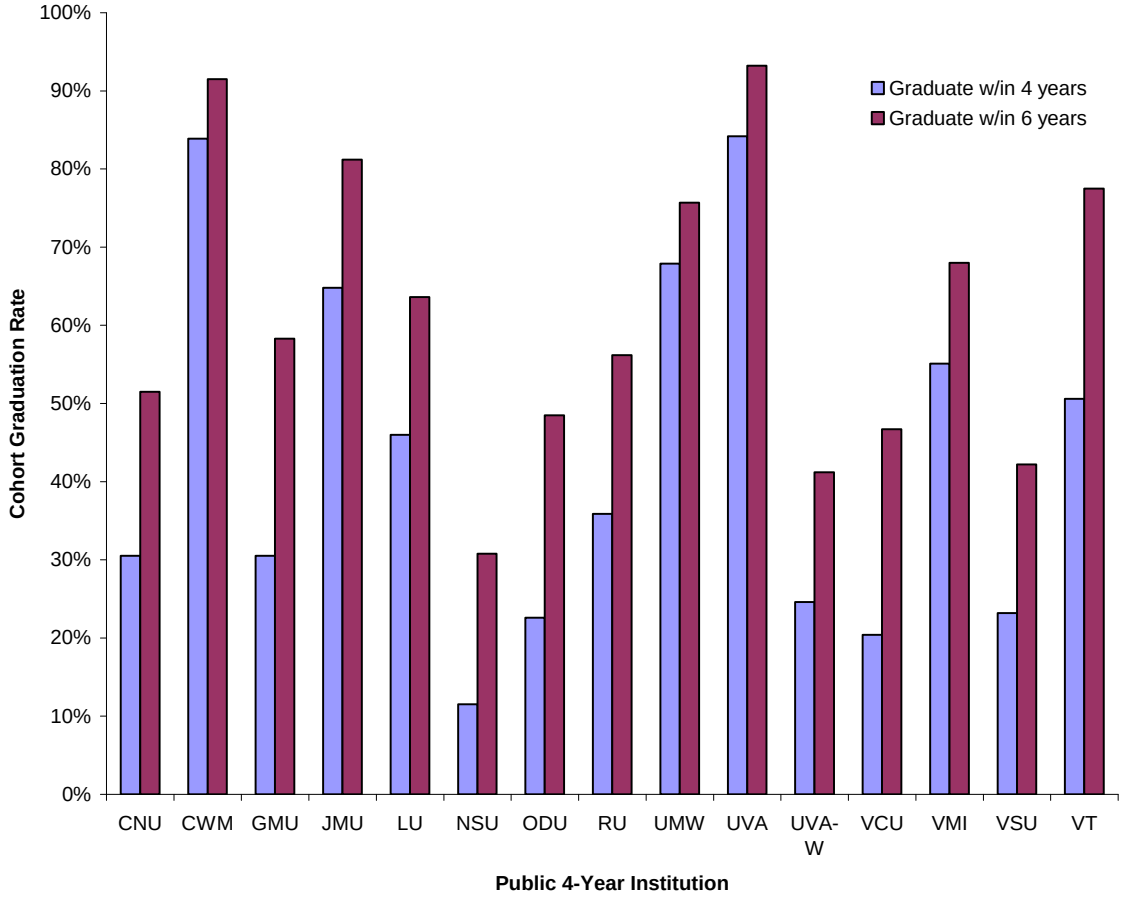
	Low Income				High Income			
	CC	UVa	VCU	Princeton	CC	UVa	VCU	Princeton
Student Expectations of Net Cost								
$0 to <$5k	91.7%	15.2%	33.3%	12.8%	91.2%	24.1%	36.7%	11.7%
$5k to <$10k	5.6%	50.5%	42.7%	11.7%	8.4%	49.6%	47.8%	12.6%
$10k to <$15k	1.9%	24.8%	13.5%	20.2%	0.0%	16.2%	11.4%	18.8%
$15k to <$20k	0.9%	4.8%	7.3%	16.0%	0.4%	8.3%	2.9%	25.9%
$20k to <$30k	0.0%	2.9%	2.1%	20.2%	0.0%	1.5%	0.4%	19.7%
$30k to <$40k	0.0%	1.0%	0.0%	7.4%	0.0%	0.4%	0.8%	6.7%
$40k to $50k	0.0%	1.0%	1.0%	9.6%	0.0%	0.0%	0.0%	4.2%
>$50k	0.0%	0.0%	0.0%	2.1%	0.0%	0.0%	0.0%	0.4%
Don't know	10.7%	13.2%	20.7%	22.3%	18.9%	17.6%	24.1%	26.0%
Parent Expectations of Net Cost								
$0 to <$5k	74.4%	23.1%	25.6%	5.9%	74.3%	33.7%	37.8%	21.5%
$5k to <$10k	5.8%	33.9%	28.9%	8.5%	5.3%	36.5%	32.2%	10.9%
$10k to <$15k	0.0%	12.4%	10.7%	14.4%	0.6%	6.8%	3.4%	16.2%
$15k to <$20k	1.7%	5.0%	4.1%	13.6%	0.0%	3.4%	1.9%	10.3%
$20k to <$30k	0.0%	2.5%	3.3%	10.2%	0.3%	0.3%	0.3%	8.7%
$30k to <$40k	0.0%	0.8%	0.0%	7.6%	0.0%	0.0%	0.0%	2.5%
$40k to $50k	0.0%	0.0%	0.0%	1.7%	0.0%	0.0%	0.0%	0.6%
>$50k	0.0%	0.0%	0.0%	0.8%	0.0%	0.0%	0.0%	0.3%
Don't know	18.2%	22.3%	27.3%	38.3%	19.3%	18.9%	24.2%	28.9%

Table 9. Social networks of college applicants

	Family Income $0 to $74,999	Family Income $75,000 or higher
University of Virginia	64.2%	86.9%
William and Mary	57.7%	72.3%
Virginia Tech	82.1%	87.2%
Most Selective Research University	36.6%	48.6%
Most Selective Liberal Arts College	18.7%	29.8%
Flagship Public College outside VA	41.5%	55.9%
Number of Students	123	329

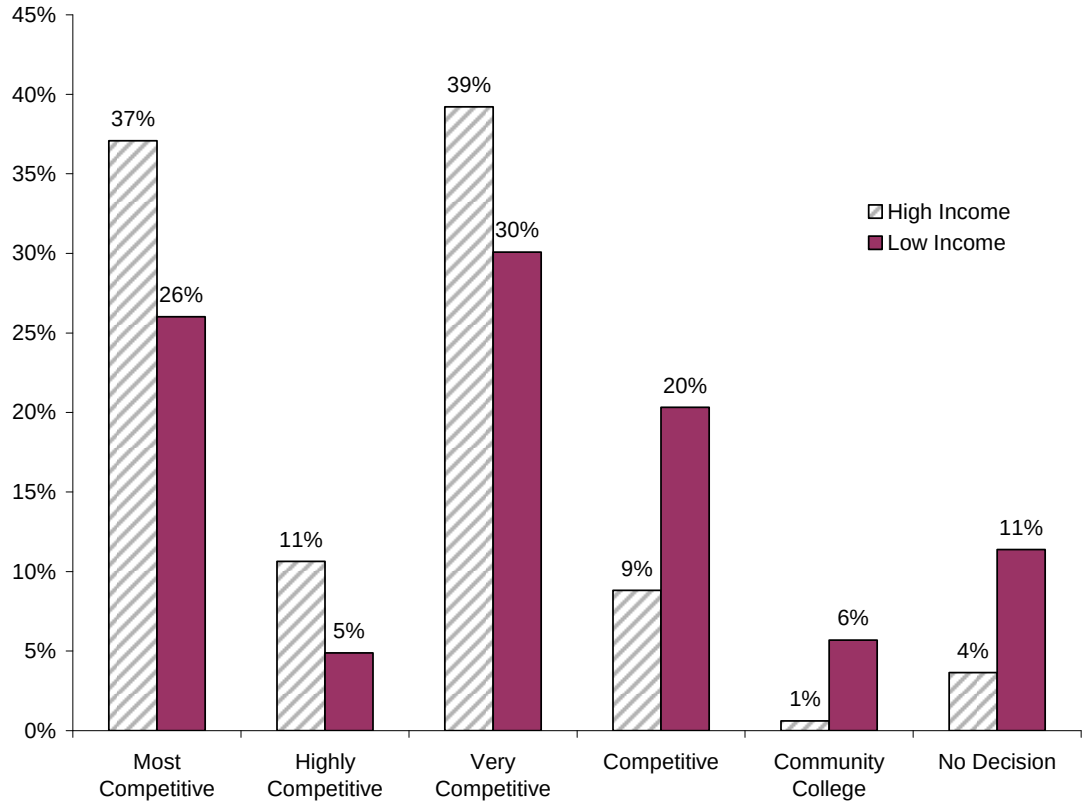
Notes: Authors' tabulations from Application and Aid Awareness Survey. Based on responses to question H.7 of the fall student survey.

Figure 1 Cohort completion rates for first-time students at Virginia public colleges and universities, 2001 entering cohort



Source: http://research.schev.edu/gradrates/cohortgradsrates.asp

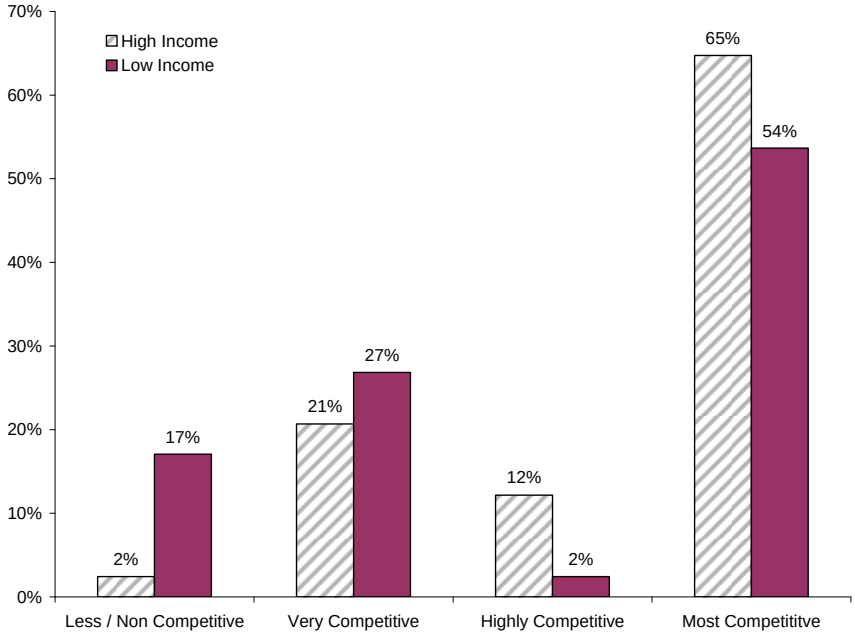
Figure 2. College Choice by Selectivity Ranking



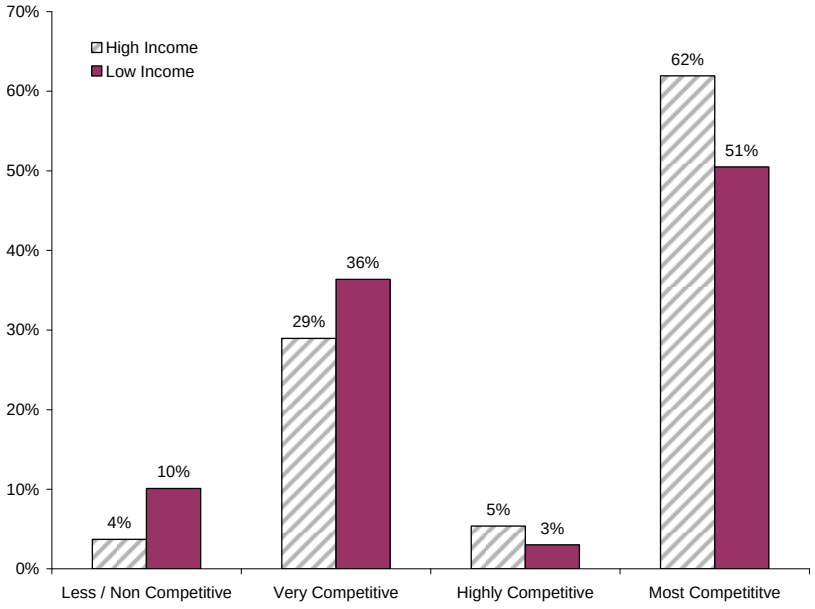
Notes: Authors' tabulations from Aid and Application Awareness Survey, Spring Survey, questions F1 and F2.

Figure 3. Highest Ranked Application by Family Income

A. Highest Ranked of All Institutions

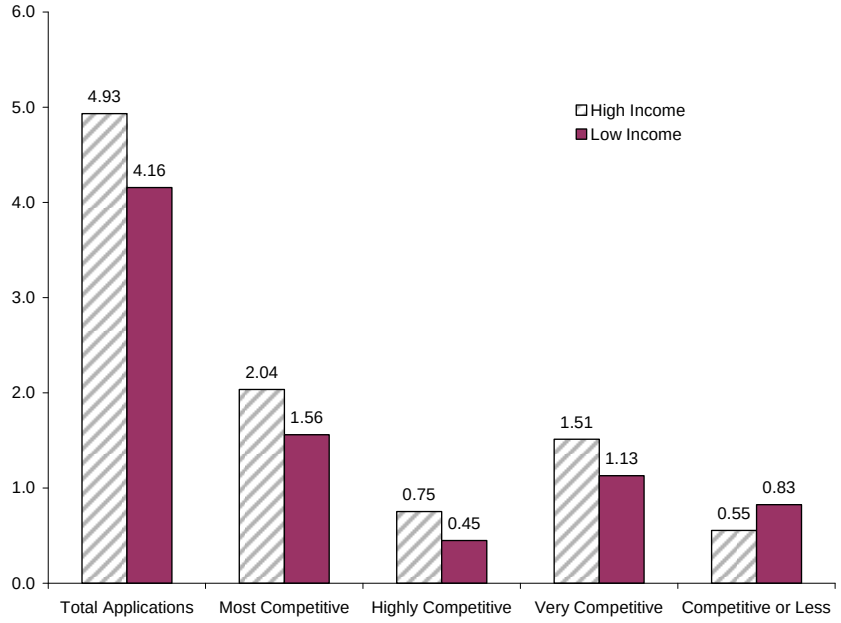


B. Highest Ranked of In-State Applications

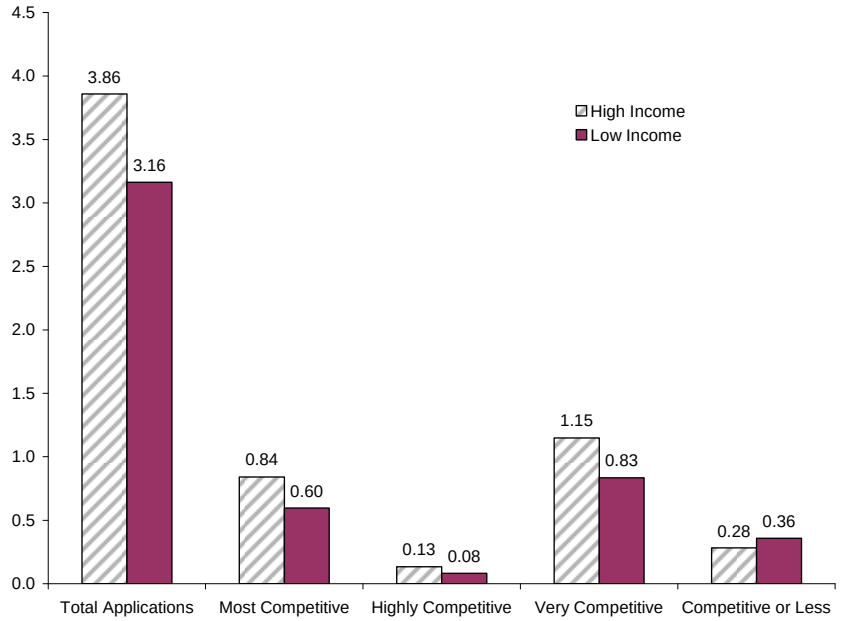


Note: Schools in the Community College, Less Competitive and Competitive Categories are included in the “Less / Non-Competitive” category.

Figure 4. Average Number of Applications by Institutional Characteristics
Panel A. Applications to All Schools



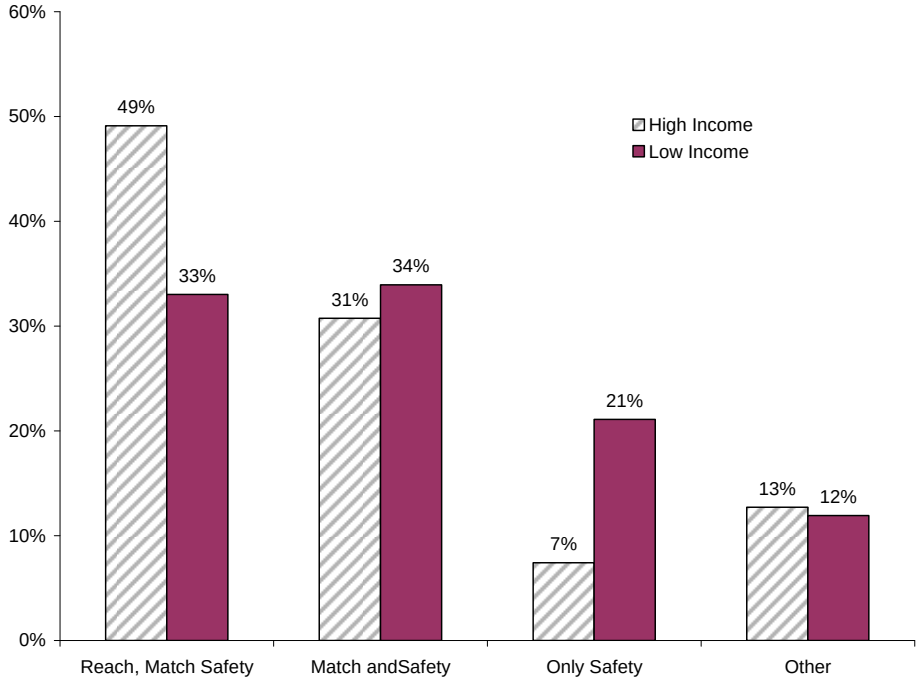
Panel B. Applications to In-State Schools



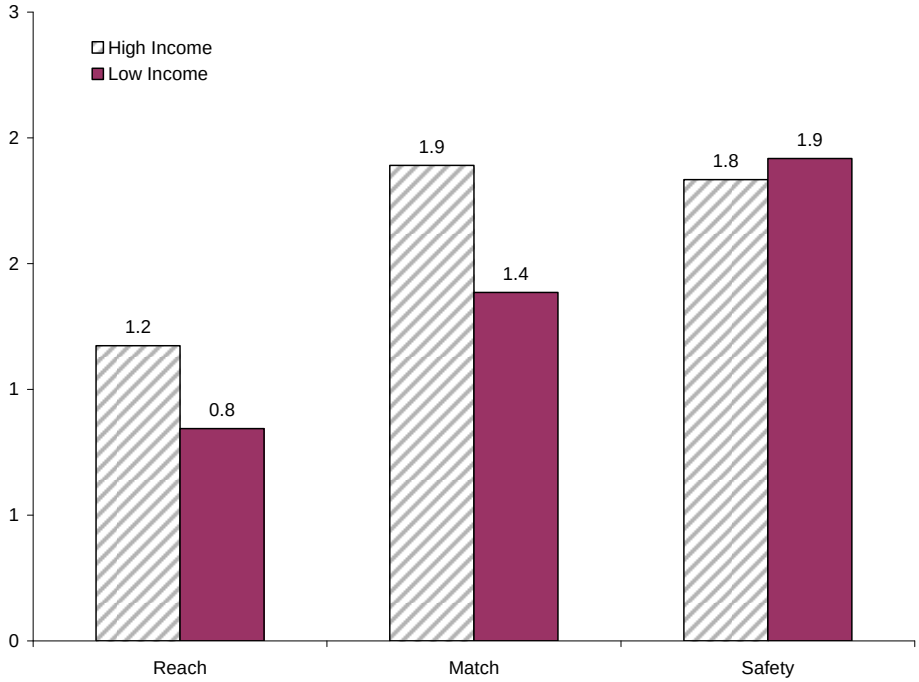
Notes: Authors' tabulations from Aid and Application Awareness Survey, Spring Survey. Tabulations limited to those not matriculating through an early decision program.

Figure 5. Application Portfolios of Students

Panel A. Portfolios of Applications



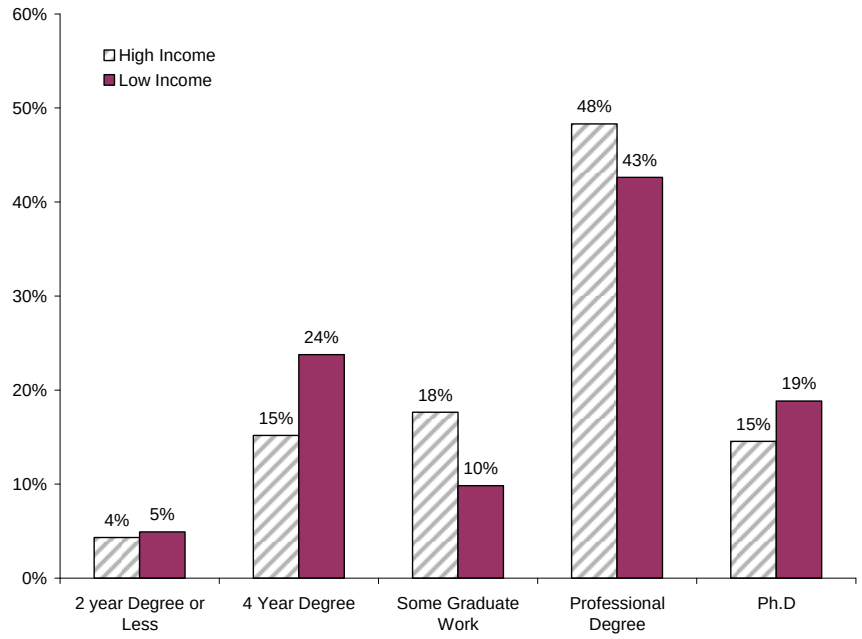
Panel B. Numbers of Applications



Notes: Authors' tabulations from Aid and Application Awareness Survey, Spring Survey. Tabulations limited to those not matriculating through an early decision program.

Figure 6. Aspirations for Educational Attainment

A. Student Expectations



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B. Parent Expectations

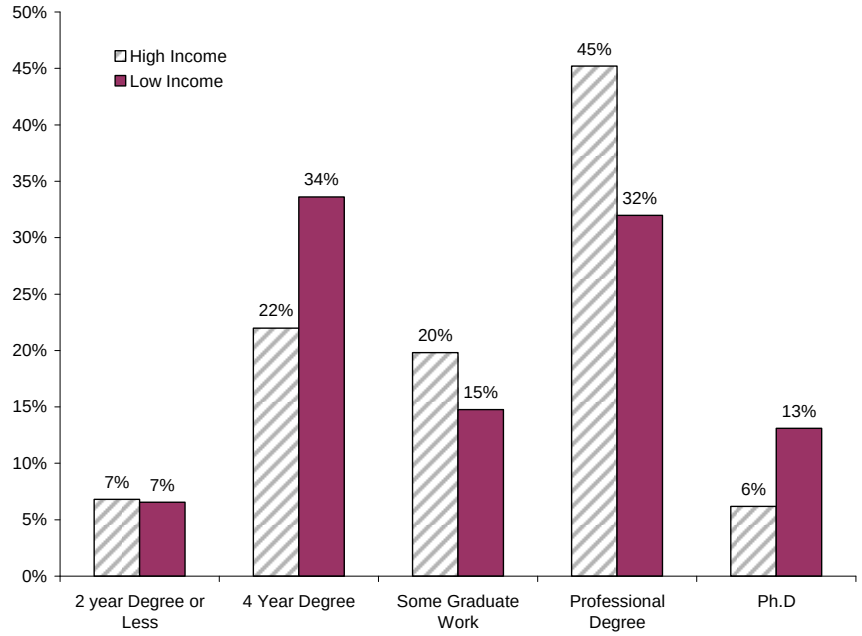
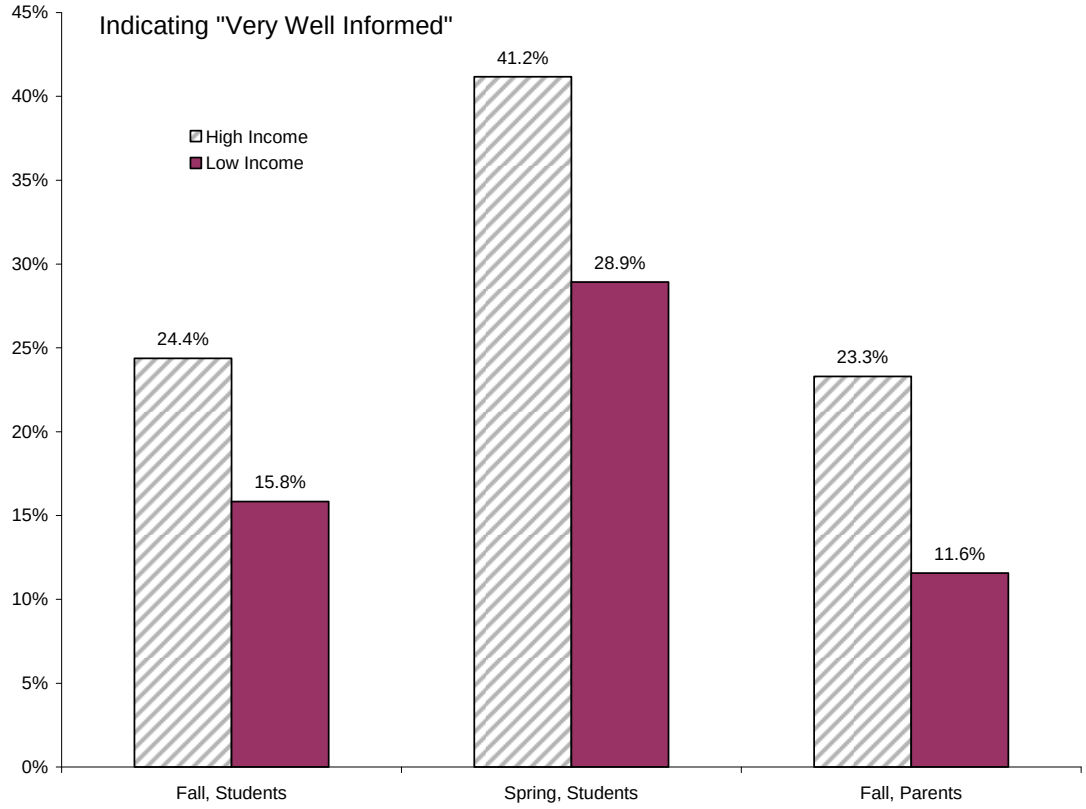
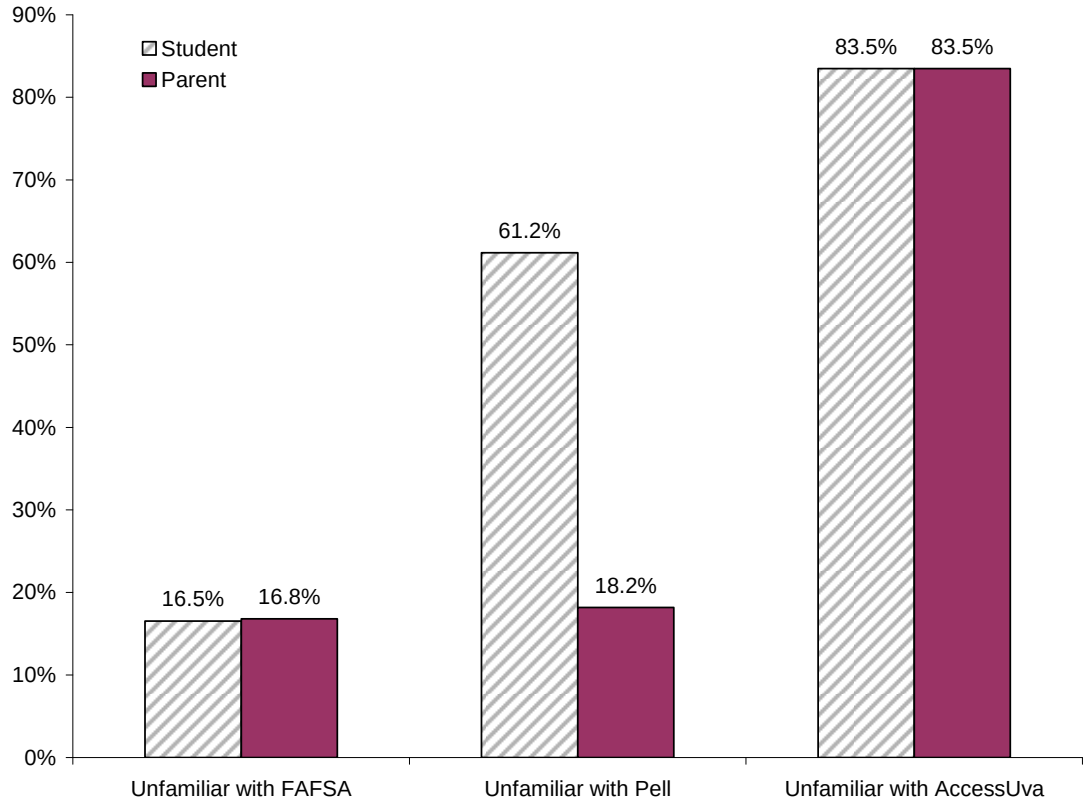


Figure 7. Self-reported indicators of preparation for college application process, Parents and Students



Notes: Authors' tabulations from Aid and Application Awareness Survey, Spring Student Survey, Fall Parent Survey and Fall Student Survey. Tabulations based on responses to questions A.1 (Spring) and C.1 (Fall).

Figure 8. Knowledge of Financial Aid Programs among Relatively Low-Income Students and Parents



Notes: Authors' tabulations from Aid and Application Awareness Survey, Fall Parent Survey and Fall Student Survey. Tabulations based on responses to questions K.1, N.1 and N.3.

Appendix Table 1. Regression of Number of Applications (Count) on Information Indicators

	(1)	(2)	(3)	(4)	(5)	'(6)	(7)
Income < $75,000	-0.095	-0.082	-0.087	-0.094	-0.1	-0.013	0.007
	[0.054]*	[0.055]	[0.059]	[0.054]*	[0.054]*	[0.056]	[0.062]
SAT Verbal	0.002	0.002	0.002	0.002	0.002	0.002	0.001
	[0.000]***	[0.000]***	[0.000]***	[0.000]***	[0.000]***	[0.000]***	[0.000]***
SAT Math	0.002	0.002	0.002	0.002	0.002	0.002	0.002
	[0.000]***	[0.000]***	[0.000]***	[0.000]***	[0.000]***	[0.000]***	[0.000]***
Very Well Informed (Parent)		0.017					-0.005
		[0.057]					[0.059]
Very Well Informed (Student)		0.159					0.116
		[0.053]***					[0.054]**
No Knowledge FAFSA			-0.082				-0.056
			[0.059]				[0.061]
No Knowledge FAFSA x < $75k			-0.138				-0.193
			[0.151]				[0.153]
Know Peer William & Mary						0.012	0.015
						[0.057]	[0.057]
Know Peer Univ. of Va						0.189	0.167
						[0.075]**	[0.076]**
Know Peer VaTech						-0.041	-0.032
						[0.075]	[0.075]
Know Peer Most Sel Lib Art						0.068	0.064
						[0.055]	[0.056]
Know Peer Most Sel Research U						0.158	0.155
						[0.057]***	[0.058]***
Know Peer Very Sel Research U						0.114	0.108
						[0.059]*	[0.060]*
UVa Net Cost $5-10k				-0.038			-0.026
				[0.062]			[0.063]
UVa Net Cost $10-50k				-0.098			-0.064
				[0.071]			[0.072]
UVa Net Cost Unknown				-0.177			-0.143
				[0.080]**			[0.080]*
Princeton Net Cost $5-10k					-0.077		
					[0.101]		
Princeton Net Cost $10-50k					-0.108		
					[0.074]		
Princeton Net Cost Unknown					-0.215		
					[0.084]**		
Constant	-0.955	-0.988	-0.888	-0.796	-0.719	-0.78	-0.64
	[0.372]**	[0.373]***	[0.373]**	[0.381]**	[0.383]*	[0.374]**	[0.383]*
Observations	452	452	452	452	452	452	452

Estimates are based on a Poisson specification. Standard errors in brackets * significant at 10%; ** significant at 5%; *** significant at 1%

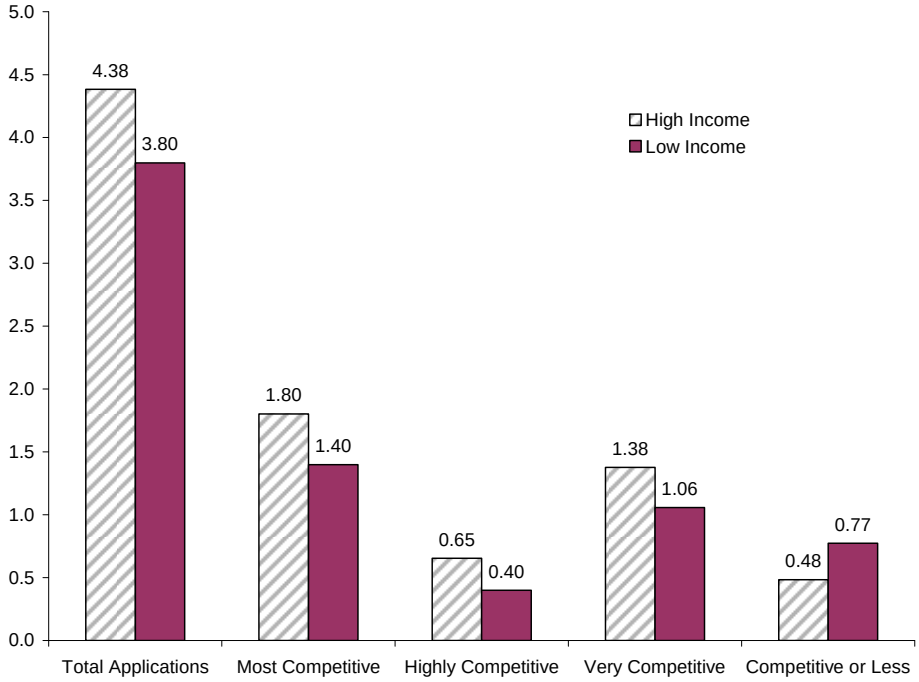
Appendix Table 2. Regression of Number of "Most Competitive" Applications (Count) on Information Indicators

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Income < $75,000	-0.162	-0.119	-0.162	-0.147	-0.175	0.015	0.073
	[0.088]*	[0.089]	[0.094]*	[0.088]*	[0.088]**	[0.091]	[0.099]
SAT Verbal	0.005	0.005	0.005	0.005	0.005	0.004	0.004
	[0.001]***	[0.001]***	[0.001]***	[0.001]***	[0.001]***	[0.001]***	[0.001]***
SAT Math	0.005	0.005	0.005	0.005	0.005	0.004	0.004
	[0.001]***	[0.001]***	[0.001]***	[0.001]***	[0.001]***	[0.001]***	[0.001]***
Very Well Informed (Parent)		0.191					0.113
		[0.085]**					[0.088]
Very Well Informed (Student)		0.333					0.248
		[0.080]***					[0.082]***
No Knowledge FAFSA			-0.135				-0.087
			[0.096]				[0.098]
No Knowledge FAFSA x < $75k			-0.185				-0.364
			[0.281]				[0.285]
Know Peer William & Mary						0.276	0.285
						[0.098]***	[0.098]***
Know Peer Univ. of Va						0.32	0.287
						[0.135]**	[0.135]**
Know Peer VaTech						-0.308	-0.317
						[0.121]**	[0.122]***
Know Peer Most Sel Lib Art						0.28	0.259
						[0.084]***	[0.085]***
Know Peer Most Sel Research U						0.331	0.309
						[0.092]***	[0.092]***
Know Peer Very Sel Research U						0.191	0.181
						[0.093]**	[0.094]*
UVa Net Cost $5-10k				-0.095			-0.04
				[0.092]			[0.094]
UVa Net Cost $10-50k				-0.314			-0.229
				[0.115]***			[0.116]**
UVa Net Cost Unknown				-0.283			-0.214
				[0.128]**			[0.129]*
Princeton Net Cost $5-10k					-0.178		
					[0.150]		
Princeton Net Cost $10-50k					-0.265		
					[0.106]**		
Princeton Net Cost Unknown					-0.429		
					[0.126]***		
Constant	-6.18	-6.34	-6.078	-5.758	-5.646	-5.519	-5.296
	[0.601]***	[0.607]***	[0.604]***	[0.621]***	[0.619]***	[0.603]***	[0.629]***
Observations	452	452	452	452	452	452	452

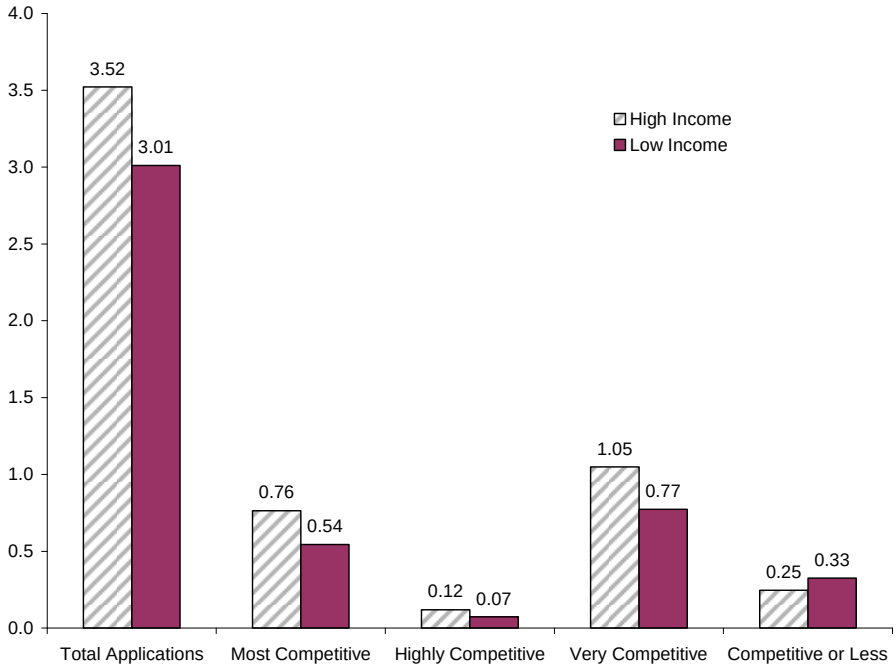
Estimates are based on a Poisson specification. Standard errors in brackets * significant at 10%; ** significant at 5%; *** significant at 1%

Appendix Figure 1. Average Number of Applications by Institutional Characteristics

Panel A. Applications to All Schools



Panel B. Applications to In-State Schools



Notes: Authors' tabulations from Aid and Application Awareness Survey, Spring Survey. Tabulations those matriculating through an early decision program.