FIRST GENERATION COLLEGE STUDENTS AND SELECTIVE COLLEGE ADMISSION:
A QUANTITATIVE EXAMINATION OF CLASS-BASED AFFIRMATIVE ACTION

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Abstract

Relatively few students from lower socioeconomic backgrounds are enrolled in the most selective American colleges and universities. To improve enrollment, scholars have suggested that college admission offices provide these low SES students an admissions advantage, also known as class-based affirmative action. This study examined to what degree class-based affirmative action is being employed by admissions offices at highly selective colleges. The dataset includes 208,507 records, one for each student application to each of 14 highly selective universities, and includes many factors considered in admissions decisions, such as first generation to college status, which served as this study’s proxy for low SES. To reveal correlation between socioeconomic status and two important stages of the College Destination Process – admissions and matriculation – separate from other confounding admission and enrollment factors, such as test scores, gender, and race, a logistic regression analysis was used. This analysis showed an admissions advantage being provided by the set of schools, though the degree of advantage provided by individual schools varied, including one school that put first generation college students at a clear disadvantage. Results were inconclusive for an analysis of the relative likelihood for first generation college students enrolling after having been offered admission, possibly because of important missing variables. The study’s overall results confirm the existence of class-based affirmative action among highly selective colleges, while the results by individual college suggest that many colleges could be providing an even greater admissions advantage to first generation college students than they currently do.

Keywords: class-based affirmative action, college admission, College Destination Process, first generation college students, holistic admission, socioeconomic status, undermatching
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Chapter One: Introduction

Statement of the Problem

“I couldn’t afford to go on a bunch of college visits,” she said. “I couldn’t hire a personal tutor. I couldn’t enroll in SAT prep classes. We didn’t have the money.”

“Some of my teachers straight-up told me that I was setting my sights too high,” she continued. “They told me I was never going to get into a school like Princeton.”

(Stratford, 2013)

On November 12, 2013, first lady Michelle Obama, a first generation college student who graduated from Princeton, addressed students at an under-resourced Washington, DC high school on the topic of low-income students attending selective colleges. The following day, Gene Sperling, Director of the National Economic Council, convened a meeting of university presidents at the White House to discuss the very same topic, which was followed by a major White House summit on this topic on January 16, 2014.

This was not the first time, nor would it be the last, that Washington officials would show significant concern for low-income student enrollment and support. In 2008, Senators Max Baucus and Charles Grassley, Chairman and Ranking Member (respectively) of the powerful Senate Finance Committee, publicly issued a letter to the Presidents of the country’s wealthiest 136 colleges. The letter inquired about “approaches that universities and colleges can adopt to address” “the problem of low and middle income students” and, with a not-well-veiled threat, reminded the colleges that “university endowments receive very generous tax breaks under the Internal Revenue Code” (Baucus & Grassley, 2008, p. 2). In 2016, Congress repeated the exercise for the 56 wealthiest private universities, referencing the colleges’ “numerous tax preferences” and promising to conduct “additional oversight of how colleges and universities are
using endowment assets to fulfill their charitable and educational purposes” (Hatch, Brady, & Roskam, 2016, p. 2). To complement these actions, the House Ways and Means committee held hearings on the topics of university endowments, college costs, and low- and mid-socioeconomic status (SES) student enrollment in both 2015 and 2016 (Committee on Ways and Means, 2015, 2016). One member of the House committee announced that he planned to introduce a bill that would require colleges with endowments greater than $1 billion to spend at least a quarter of their annual endowment gains on financial aid “for students from middle and working class families” (Reed, 2016, p. 2). If such a bill were to be enacted, it likely would require the colleges not only to improve their aid, but also to increase the proportion of less-than-affluent students in their student bodies.

The reason why the government has concern about this issue is that students of lower socioeconomic status (low SES), including first generation college students, are underrepresented at American selective four-year universities, and this can exacerbate issues of income inequality by decreasing social mobility. Qualified students from low SES backgrounds are less likely to attend college at all, even if they are qualified to do so (Smith, Pender, & Howell, 2013). At the most highly selective 80 colleges in the United States, only 12% of students are low-income Americans receiving Pell Grants, while 35% of all college students are Pell Grant recipients (Hearn & Rosinger, 2014). Another recent study estimates that at the most selective 193 colleges, 65% of students come from the top quartile of socioeconomic status, while only 5% of students come from the lowest quartile (Carnevale, Rose, & Strohl, 2014). And if considering a very elite group of 12 highly selective colleges, including the eight members of the Ivy League, only 13.5% of students come from the bottom half of American incomes, fewer
than come from just the top one percent of incomes (Chetty, Friedman, Saez, Turner, & Yagan, 2017).

**Research problem.** This study seeks to understand why low SES students are underrepresented at selective colleges. It could be that low SES students are less likely to apply to these colleges (Griffith & Rothstein, 2009). It is also possible that these students are applying to selective colleges and being admitted, but they are choosing not to attend because the colleges are too expensive, with insufficient financial aid (Dezhbakhsh & Karikari, 2010).

Yet another possibility is that low SES applicants are discriminated against in the admissions process. The holistic admission process used by most selective universities today has its roots in discrimination against Jewish applicants (Karabel, 2006). Favoritism towards the wealthiest families has been well documented (Golden, 2009). So-called “legacies” – applicants whose parents attended the same selective college – are also favored in the admissions process (Hurwitz, 2011). High SES students appear to have many advantages.

This study will specifically look at the admissions process and its effect on the enrollment of first generation college students, a common proxy for low SES students. Is there evidence of admissions offices discriminating against first generation college students? Or, possibly, are college admissions officers providing first generation college applicants with an admissions advantage?

**Justification for the research problem.** When low-income students attend college – which, as previously noted, they do at a much lower rate than high-income students – they are more likely to attend schools that are of a lower quality than what they could academically qualify for, a phenomenon known in the literature as “undermatching” (Bastedo & Jaquette, 2011; Smith et al., 2013). To ameliorate the problem, policy analysts, researchers, and
practitioners have called for universities to practice class-based affirmative action (Ballinger, 2007; Carnevale & Rose, 2004; Conley, 2014; Kahlenberg, 1997). Like race-based affirmative action, class-based affirmative action provides an admissions advantage for disadvantaged applicants, in this case socioeconomically disadvantaged students.

Race-based affirmative action has been thoroughly studied since its introduction in the 1960s (Askin, 1969; Bowen & Bok, 1998; Keith, Bell, Swanson, & Williams, 1985; O'Neil, 1971; Posselt, Jaquette, Bielby, & Bastedo, 2012; Sleeth & Mishell, 1977). The topic has been the subject of a major research study conducted jointly by the former presidents of Harvard and Princeton (Bowen & Bok, 1998). It continues to be a major focus of research at the American Council on Education (ACE), which represents more than 1700 colleges (Espinosa, Gaertner, & Orfield, 2015). The body of research into race-based affirmative action has been cited in multiple Supreme Court opinions ("Fisher v. University of Texas at Austin," 2013; "Fisher v. University of Texas at Austin," 2016; "Grutter v. Bollinger," 2003; "University of California Regents v. Bakke," 1978).

Class-based affirmative action has been widely discussed, but not been rigorously studied to the same degree. The literature on the topic begins roughly three decades after the literature on race-based affirmative action, in the 1990s. Educational research work on class-based affirmative action picked up significantly following the publication of the widely-cited work The Remedy: Class, Race, and Affirmative Action (Kahlenberg, 1997).

Literature on undermatching is even more recent. Scholars commonly consider the first research to introduce the concept of “matching” or “undermatching” to be a 2008 report from a Chicago non-profit (Roderick, Nagaoka, Coca, & Moeller, 2008). The widely cited research of
Caroline Hoxby (Hoxby & Avery, 2012; Hoxby & Turner, 2013a, 2013b) has made undermatching part of a national conversation.

This study will contribute to the national conversation on undermatching. Further, it will inform policy conversations about class-based affirmative action. Overall, these important topics deserve further inquiry.

**Deficiencies in the evidence.** As the calls for class-based affirmative action have increased, there is little data on to what degree, if any, selective colleges are employing it. Griffith and Rothstein (2009), using data from the early 2000s, found that even when employing controls, students from the lowest income families are much less likely to be admitted to selective colleges than students from high income families. Using a different data set from the 1990s, Bowen, Kurzweil, and Tobin (2005) found that first generation college students and low income students “get essentially no break in the admissions process,” with “essentially identical” admission odds compared with all other students (p. 166). However, using a dataset related to Bowen, Kurzweil and Tobin’s, Espenshade, Radford, and Chung (2009) found an admissions advantage for lower and working class applicants. In short, the three prominent studies do not agree whether there is an effect, and if so whether it is positive or negative. These studies also use data before undermatching became a national conversation to the degree it is today, and before the federal government began to make it an issue. Little is known about class-based affirmative action in practice today.

Further, while these studies have looked at class-based affirmative action in the aggregate, no studies have looked at the practice at multiple individual colleges. Because college admissions offices operate autonomously of one another, and because different colleges have
different missions and goals, it could be that significant effects at individual colleges are masked by opposite effects at other colleges. This study will consider behaviors at individual colleges.

**The Significance of the Problem**

**As an issue of economic and moral equity and fairness.** Undermatching is a problem because attendance of selective colleges conveys advantages to students. For example, numerous studies have found a wage premium for attending more selective colleges (Brewer, Eide, & Ehrenberg, 1999; Broecke, 2012; Monks, 2000). That is to say, students who graduate from more selective colleges with the same degree – a bachelor’s degree – as those at less selective schools earn greater income. One notable study that does not find a general wage premium for selective college attendance still found the premium in specific cases, including for low-income and other disadvantaged students (Dale & Krueger, 2011). Students also benefit from an increased likelihood of earning their degree at more selective, better-resourced schools (Bound, Lovenheim, & Turner, 2010). In addition, highly selective colleges provide greater access to the most elite careers (Rivera, 2015).

Highly selective colleges can also provide greater resources to all students, including low-income students (Hoxby, 2009). This has long been true, but is even more true today. Hoxby (2009) found that in 1967, the most selective colleges spent 4.5 times as much on a per student basis on student support as the least selective colleges; in 2006, they spend 7.7 times as much. In dollars, this is $92,000 per student versus $12,000 per student. Included in this measure is faculty who are “better” by traditional measures (percent with Ph.D.s, scholarly research production), as well as more access (at least numerically) as measured by student to faculty ratio.

Economic inequality is increasing in the United States. According to the Congressional Budget Office, between the years of 1979 and 2007, the top 1% of American households saw
their income grow by 275 percent, while the bottom 20% saw their incomes grow by just 18% (Congressional Budget Office, 2011). In the same time period, the top 20% of American households saw their share of income rise by 10 percentage points, while the rest of the population saw their share of income fall (Congressional Budget Office, 2011).

The nation’s system of higher education contributes to the growing issue of income inequality (Carnevale & Strohl, 2010). As the income gap has widened, so too has the gap of academic achievement between wealthy and poor Americans (Reardon, 2011). At America’s top colleges, where the economic benefits of attendance are greatest, students from low-income families are significantly underrepresented (Hill & Winston, 2010).

**As an issue for colleges and universities.** Universities and non-profit organizations have made a public push to enroll more low-income students in the most selective colleges, but achieving results has proved difficult. In the half decade that followed announcements of low-income initiatives by Harvard and many other colleges in 2004, the average percentage of Pell Grant recipients – a common proxy for low-income students – at America’s 50 wealthiest colleges actually declined (Supiano & Fuller, 2011). At nearly two-thirds of these colleges, no progress was made (though gains were made at five of the six wealthiest institutions, and the three wealthiest liberal arts colleges).

Rankings- and prestige-conscious schools also have greater incentive now to enroll a socioeconomically diverse class. A number of national college rankings include some proxy for economic diversity (Kelchen, 2014), and one from the *New York Times* considers only socioeconomic diversity and affordability (Leonhardt, 2014a). In 2015, the Jack Kent Cooke Foundation introduced its Cooke Prize for Equity in Educational Excellence to highlight and reward universities that enroll low SES students; the first award was won by Vassar College
(Leonhardt, 2015). Overall, diversity often has a positive correlation with a college’s reputation, prestige, and market desirability (Stevens, 2009).

**Positionality Statement**

For my doctoral research, I am investigating the problem of the lack of socioeconomic diversity in college admission and enrollment. Low-income students are severely underrepresented at America's most selective universities, as are students who are the first generation in their family to attend college. Despite increasing attention to the issue by the media, scholars, and the government, and despite actions taken by many elite schools in the middle of the last decade, the educational gap between low- and high-income students continues to increase. I hope to contribute to an increasing body of research on the topic, and ultimately to make a difference in this area.

I recognize that I bring some researcher bias to this process. This positionality statement aims to enumerate and investigate those biases. Further, through this statement I aim to isolate my biases in order to bring neutrality to my doctoral research.

**My background.** It is first worth noting that I was a first generation college student. Neither of my parents attended or graduated from a four-year college, holding only high school diplomas. Both my parents worked in lower skill jobs, despite their talents. I required significant financial aid to attend a private, highly selective four-year university. Thus, my research investigates the plight of students who are, in a number of ways, like me.

I also have bias in that I work in the field I am studying, college admission. Myself and my colleagues and friends in the field are the object of much of my research work. Further, not only do I work in college admission, but the institution at which I work is among the so-called elite institutions that are most criticized for not enrolling sufficient numbers of low-income and
first generation college students. Institutions like mine have been criticized for a lack of socioeconomic diversity in the press (Dreier & Kahlenberg, 2014; Supiano & Fuller, 2011). To some degree, I have internalized this criticism, though there exists the possibility that my research could uncover that this criticism is unwarranted. I am motivated to solve this problem that has been the focus of much scrutiny for my institution and my office.

**My biases and positions.** I also have political opinions about my research. I believe that access to higher education for students across the income spectrum is a matter of moral, economic, and social justice importance for the United States. Students from low-income backgrounds are disadvantaged in achieving access to our country’s highly selective universities, which in turn further disadvantages them in the job market, establishing a cycle of poverty and a permanent upper class (Berg, 2010). Also, as a nation, we are underdeveloping our talent. I believe that in tapping into the rich potential of all of our students – from all socioeconomic, racial, gender, and other backgrounds – the nation’s economy can be improved, and the nation can better achieve social justice.

**Positionality conclusion.** My hope is that, to some degree, my upbringing in a disadvantaged class will also provide an advantage in my research on low-income students and undermatching in university admission. Previous research has shown the limitations of research on the disadvantaged by the privileged (Briscoe, 2005). Research has also found that when ideas emanate largely from an outside perspective, and the research subjects are *othered*, that a field can be hegemonized (Fennell & Arnot, 2008). While in my review of the literature I have not identified any clear examples of bias or *othering*, I still hope that my experiences as a part of this *other* class will provide insight that may not be available to other researchers.
Research Questions

This study investigates the problem of the lack of socioeconomic diversity in highly selective college enrollment. Specifically, it asks, how do different stages of the college admissions process contribute to class inequities in enrollment? The primary research questions focus on two important stages of the college admissions process. The research questions are:

1. To what degree, if any, do admissions offices provide an admissions advantage to students from low socioeconomic status backgrounds, holding other factors constant?
2. To what degree, if any, does being a student from a low socioeconomic status background impact matriculation at highly selective colleges, holding other factors constant?

Theoretical Framework

The problem of underrepresentation of lower class students at highly selective American universities has been a focus of research over the past two decades. Previous literature has examined some of the sources of the underrepresentation, including less access to preparation and fewer applications submitted. As this study examines the impact of specific, later steps in the college process (namely the admissions and matriculation processes), a theoretical framework that delineates the college choice process into discrete steps and their influences is most appropriate. Specifically, this study will use the College Destination Process framework, which was proposed by Radford (2013) as an evolved version of the popular three-stage model of college choice proposed by Hossler and Gallagher (1987).

College choice frameworks. The seminal work in the literature on college choice theoretical frameworks is “Studying Student College Choice: A Three-Phase Model and the Implications for Policymakers” by Hossler and Gallagher (1987). Radford (2013), in a reflection
of recent scholarship, calls their paper “particularly influential in the field” (p. 16). At the time of the paper, Hossler and Gallagher were early career education researchers; today, they are both legends. Hossler is a professor of educational leadership and policy studies at Indiana University, and Gallagher is the Dean of the Rossier School of Education at the University of Southern California.

As the seminal paper’s title suggests, the Hossler and Gallagher (1987) model comes in three phases: predisposition, search, and choice. In this model, the predisposition phase includes the various influences on students as they decide if they wish to attend college, including ability, socioeconomic status, parents, peers, high school, and geography. The search phase is a two-way street, with students seeking to identify well-matched colleges, and colleges seeking to find students. Finally, in the choice phase, students narrow their college choices to ultimately select a college, with financial aid and the yield activities of colleges among the factors playing a significant role. With this framing, Hossler and Gallagher suggested that too much of college recruitment efforts were being focused on the choice phase when in fact they would be more effective earlier, at the search phase.

Hossler and Gallagher (1987) cite the earlier work of Jackson (1982) as a key antecedent of their model. Like Hossler and Gallagher would half a decade later, Jackson proposed a three-stage model of college choice. Jackson’s stages are preference, exclusion, and evaluation. In this model, Jackson draws heavily on the fields of economics and public policy to examine the various influences as students decide whether to attend college or pursue non-college options like jobs. In the preference stage, academic achievement, socioeconomic context, and other factors influence a student’s post-high school aspirations. In the exclusion stage, geography and information about options (e.g., facts about a particular college or set of colleges), among other
factors, influence which options a student considers and which are not and are thus excluded.

Finally, in the evaluation stage, students apply an internally developed rating scheme to the options in their choice set to ultimately make a decision. Jackson (1982) uses the various influencing factors in each stage to suggest what policy interventions would most influence college-going behavior.

Hossler and Gallagher (1987) also draw upon the college choice model of D. W. Chapman (1981). Unlike Hossler and Gallagher (1987) and Jackson (1982), D. W. Chapman (1981) is not built around distinct, sequential stages, but rather seeks to identify the relationships between various factors that result in a student choosing a college, and also those that result in a college choosing a student. These factors include both student characteristics, like ability and socioeconomic status, as well as external influences, like parents and peers and the colleges themselves. The model was developed to provide a framework for college administrators and admissions officers to better conceptualize the challenges and opportunities of student recruitment.

Inspired in part by Hossler and Gallagher (1987) and other preceding models, Paulsen (1990) proposed his version of a three stage model. In Paulsen’s model, the stages are college aspiration formation, college search and application, and college selection and attendance. Paulsen grounds his model in decades of educational research, allowing dozens of comprehensive studies to shape the stages he sees. The stages in this model draw on many of the same influences noted in earlier models, including student characteristics, college characteristics, external influencers, college outreach information, and financial aid.

Among more recent models, the model developed by Perna (2006a) may be the most influential. Perna recognizes the significant scholarly impact of both Hossler and Gallagher
(1987) and Paulsen (1990), but also notes the many scholarly advances made in the field since these studies were published. Thus, she develops a new college choice model, utilizing the advances in human capital theory and theories of social and cultural capital. In her model, sociological and economic approaches both inform the creation of a four layer model, with all four layers influencing college choice. The innermost layer, called Habitus or layer 1, focuses on social and cultural capital, as well as student characteristics such as race and gender. Layer 2, *School and Community Context*, considers the resources and challenges in a student’s local setting. In layer 3, *Higher Education Context*, college characteristics (such as location and majors) and outreach efforts (such as marketing publications) influence college choice. Finally, in layer 4 – the outermost layer – called *Social, Economic, and Policy Context*, larger issues with broad impact can also influence students’ choices. With its embrace of sociological theory, the Perna model has been particularly influential for qualitative studies of college choice.

Still, the Hossler & Gallagher model remains the most cited college choice framework for quantitative studies, though not always in its original form. Modified versions of the Hossler and Gallagher model have been used in many papers; recent notable studies include “The Differential Impact of Wealth Versus Income in the College-Going Process” (Jez, 2014) and “Understanding College Application Decisions: Why College Sports Success Matters” (Pope & Pope, 2014).

Radford’s College Destination Process (2013) is another modified version of the Hossler and Gallagher model. First proposed in her doctoral dissertation, the College Destination Process was widely circulated in Radford’s scholarly book *Top Student, Top School?* from the University of Chicago Press (2013).

**Rationale for selecting theoretical framework.** Importantly for this study, in the College Destination Process, Radford (2013) explicitly includes both the student’s preparation
and the admissions selection process, neither of which are included explicitly in the three-stage model of college choice (Hossler & Gallagher, 1987) or other popular college choice models such as the Perna (2006a) model of student college choice. Both preparation and especially admissions selection will be an important part of this study.

The College Destination Process, unlike frameworks such as Jackson (1982) and Perna (2006a), is designed around a student’s specific college destination, not around the general choice of attending a college. This is important because this study will explore the outcomes of students who have already decided to apply to a specific set of colleges and whether the admissions offices of these colleges decide to admit them. Further, the College Destination Process is a strong fit for studies of the college process of high achieving, low income students. This can be seen since Radford’s model was developed to support her study of this topic.

**The framework’s setup and stages.** The College Destination Process (Radford, 2013) consists of six distinct stages. These stages can be seen as a linear set of steps through their primary relationships. The model also recognizes the significant secondary relationships. Through the secondary relationships, the influence of important aspects early in the process – especially predisposition and preparation – can be seen throughout the six stages of the model.
The first stage of the College Destination Process is *predisposition*. *Predisposition* encompasses a student’s attitudes toward college attendance in general and early opinions of specific types of higher education. It is in this phase that the influence of the earlier Hossler and Gallagher (1987) model can be seen; it is the only one of the College Destination Process’s (Radford, 2013) six stages that shares a name and purpose with one of the stages of three-stage model of college choice proposed by Hossler and Gallagher (1987). Hossler and Gallagher explicitly define their *predisposition* as “a developmental phase in which students determine
whether or not they would like to continue their education beyond high school” (1987, p. 209), while Radford draws the distinction that her model “is designed specifically to explore the type of college students come to attend (their destination) and not their decision to attend college” (2013, p. 17). Predisposition has a primary relationship with the preparation phase because an early inclination to attend college influences a student’s choice of preparation activities, such as taking college preparatory coursework. It also has a secondary relationship with both the application and matriculation phases because a predisposition to attend college influences a student’s decision to both apply to and matriculate at a college.

The second stage is preparation, which captures a student’s schooling and qualifications for college. This phase would include coursework pursued and grades achieved, as well as test scores on such exams as SAT, ACT, and Advanced Placement (AP). Also, because of the nature of American university admission, it also includes extracurricular activities and achievements. Radford (2013) emphasizes the overlap that preparation has with predisposition, as both activities are occurring (to some degree) simultaneously in the life cycle of a student. Preparation has a primary relationship with exploration because a student’s qualifications have a significant influence on which colleges are possible destinations for students (and for which a student may not have sufficient qualifications). Preparation has a secondary relationship with the application stage because students generally apply to colleges that match their qualifications. Importantly for this study, preparation also has secondary relationships with both the admissions stage, because colleges generally choose students with the preparation that matches their expectations, and the matriculation stage, because students generally choose colleges at which they are well prepared for success.
Students who are predisposed and prepared for college will enter the third phase, *exploration*. In exploration, students come to understand the application and admissions processes, as well as cost and financial aid, and also explore the profiles and offerings of different colleges. This stage is similar to Hossler and Gallagher’s (1987) second phase, *search*. Hossler and Gallagher (1987) state that this stage strongly influences the choice set of college to apply to, and Radford (2013) adds that there is a secondary relationship where exploration can influence the matriculation decision, as students explore and assign preferences to colleges in their decision set.

The fourth of the six phases is *application*. This is the stage at which a student completes and submits an application to college or set of colleges. This would include writing of essays or personal statements, submitting test scores, requesting letters of recommendation, and other related activities. Students necessarily will have explored colleges as a prior condition of the choice to apply. Being predisposed to attend college and being prepared for college – both earlier stages – are, understandably, influences on a student’s likelihood of applying. Perhaps more interestingly, the later stage of *admissions* also influences *application*, as students apply to colleges for which they have some likelihood of being admitted.

The fifth phase is *admission*. The results of this phase are largely out of the student’s hands, and instead fall to universities and their decision-making processes. Because many universities are selective in admission, Radford (2013) argues that admission must be considered a separate step from application and matriculation, as a student cannot matriculate at a university to which they have not been accepted. The Hossler and Gallagher (1987) framework never explicitly mentions selective admission. It is worth noting that colleges were less selective in 1987 when Hossler and Gallagher’s framework was published. The admissions phase is a primary
determinant of the matriculation phase, as a student cannot enroll in a college to which they have not been accepted. It can also influence the prior phase, application, as the positive or negative feedback from the admission process can result in a student modifying the list of colleges to which they will apply. This stage will be explicitly explored in this study’s first research question.

The sixth and final stage is *matriculation*. In this stage, students enroll at one of the colleges at which they have been admitted. This is the culminating stage of the process, with each prior step important for the ultimate matriculation decision. For example, research done in the exploration phase can significantly impact at which college a student matriculates; and being predisposed to attend college influences a student’s decision to matriculate at any college. This stage will be explicitly explored in this study’s second research question.

**The framework’s fit with the study.** The College Destination Process (Radford, 2013) model is a good fit for this study because it includes specific stages for application, admission, and matriculation, and provides both primary and secondary influences for all stages. Having explicit stages is important because it best allows an in-depth study of each phase.

This study’s research questions are set up to take advantage of the College Destination Process’s explicit steps. In the first research question, which examines whether some highly selective colleges provide an admissions preference to low SES students, is a study of the *admissions* stage. It will draw upon its primary antecedent, *application*, as well as its secondary relationship with *preparation*.

The second research question, which examines the relative likelihood of low SES students taking up their admissions offer from a highly selective college, is a study of the
matriculation stage. It, too, will draw upon its primary antecedent, admissions, as well as its secondary relationship with preparation.

Key Terms and Definitions

Admissions advantage or admission preference: An admissions advantage is shown if the one factor, held in isolation while holding other factors equal, shows increased odds (an odds ratio of greater than 1) of admission. Two well-known examples are race-based affirmative action (Espenshade, Chung, & Walling, 2004) and “legacy” preference for children of alumni and alumnæ (Hurwitz, 2011).

First generation college (FGC): Colleges commonly use first generation college status as a marker of educational disadvantage. While there are many definitions of first generation college (Supiano, 2014), this study uses the following definition: a student whose parents have not earned a four-year college degree. These students are more likely to be low-income, and less likely to attend and graduate from college (Engle & Tinto, 2008).

Selectivity: A measure of the qualifications of a college’s study body, such as SAT and ACT scores and high school grade point average (Hoxby, 2009). Selectivity is often used as a proxy for college quality and prestige (Brewer et al., 1999; Klugman, 2012; M. C. Long, 2008). As in much of the literature on college admission, this study will use the Barron’s Profiles of American Colleges selectivity categories, and will examine colleges that are rated “most competitive” (Barron's, 2016).

Socioeconomic status (SES): Socioeconomic status is commonly defined in terms of one or more of the parents’ income, education, and/or occupation (Sirin, 2005). SES is a measure of a person’s (in this study, a student’s) social and economic capital. In this study, FGC students will be considered low SES.
**Undermatching**: When comparing a student’s academic credentials and the academic profile of universities, undermatching occurs when the student enrolls at a school whose profile is less than that at other universities for which the student could qualify (Smith et al., 2013).

**Summary**

The American public, the media, and the federal government are increasingly questioning the low enrollment of low SES students in the most selective colleges in the United States. There has been some research on why this problem exists, but more work needs to be done to fully understand this important issue. This study will help in understanding this problem by examining the college admissions and enrollment process at highly selective colleges and universities.
Chapter Two: A Review of the Literature

The paired topics of low-income student admission and class-based affirmative action have become a topic of great interest to scholars since the 1997 publication of Richard Kahlenberg’s book *The Remedy: Class, Race, and Affirmative Action*. Kahlenberg argues that a college admission system where preference is given for students from lower socioeconomic backgrounds – known as class-based affirmative action – would provide greater equality of opportunity than either race-based affirmative action or a strict “meritocratic” admission system (Kahlenberg, 1997). Class-based affirmative action, however, cannot replace race-based affirmative action and still result in a similarly racially diverse enrolled student groups at selective colleges (Bowen et al., 2005; Carnevale & Rose, 2004; Espenshade et al., 2009).

Kahlenberg’s argument in the book advocating for class-based affirmative action is largely qualitative, with some support from published statistics. In the ensuing years, many economists, sociologists, political scientists, and educators have sought to understand and explain the issue from both quantitative and qualitative perspectives, and to examine the sources of the root issue: a lack of socioeconomic diversity in the nation’s top colleges.

The State of Low SES Enrollment in American Colleges

Students from high-income families are significantly overrepresented at top colleges, and conversely those from low-income families are very underrepresented. The degree of the over/under-representation depends on the parameters of the study. A 2016 analysis showed 72% of students at the most selective colleges coming from the top SES quartile, and 3% of students coming from the bottom SES quartile (Giancola & Kahlenberg, 2016). A 2017 analysis showed that at 12 colleges dubbed “Ivy Plus,” including all eight Ivy League colleges plus Chicago, Duke, MIT, and Stanford, only 3.7% of students come from the bottom quintile of parent
income, and only 13.5% come from the bottom half, while greater than 14% come from the top one percent of parent income (Chetty et al., 2017).

These results echo previous findings. Using two national data sets with tens of thousands of students each, Carnevale and Rose (2004) find that among students at top tier colleges, 74% come from the top quartile of socioeconomic status, while only 9% come from the bottom half (with only 3% from the bottom quartile). Similarly, Hill and Winston (2006b) find that at 31 elite institutions in the Consortium on Financing Higher Education (COFHE) – which includes Ivy League schools like Harvard and Princeton, top liberal arts colleges like Amherst and Williams, and other top universities like Stanford and Chicago (and in 2015 expanded to 35 schools) – 70% of students are from the top quintile of income, even though only 39% of students nationally who score highly on the SAT (1300+ out of 1600) are from this quintile. Additionally, they find that only 10% of COFHE students come from the bottom two quintiles, though nationally 16% of high scorers come from this group (Hill & Winston, 2006b).

The enrollment gap between high- and low-income students is large, and has been growing. From 1985 to 2000, Astin and Oseguera (2004) show that the proportion of high-income students at the top colleges has grown, while low-income students have remained stagnant. Further, they find that students from the top quartile in family income are overrepresented in the top college population by a factor of 2, while low-income students are underrepresented by one-half (Astin & Oseguera, 2004). They also find that since 1971, first generation college students’ access to top colleges has significantly declined (Astin & Oseguera, 2004).

In another look at college-going trends over time, Bailey and Dynarski (2011) found that while all SES cohorts increased their college enrollment and college graduation rates from 1980
through 2000, low-income students made the smallest gains, widening already wide gaps. In looking at students born between 1979 and 1982, Bailey and Dynarski (2011) find that students from the lowest income quartile enroll in college at a 29% rate, while students from the top quartile enter at an 80% rate; the low-income students graduate at a 9% rate, while the high income students graduate at a 54% rate. Both college enrollment and college graduation are significant issues for low-income students.

It is worth noting that presently, nearly all of the (relatively small number of) low-income students at top colleges are applying from high school, and are not transfer students. In a compelling analysis of the data, Dowd, Cheslock, and Melguizo (2008) show that fewer than 1 in 1,000 students at top colleges are low-income community college transfers. Further, they find that of 31 COFHE schools, 21 enrolled 5 or fewer transfer students from community colleges annually (Dowd et al., 2008).

Most analyses of low-SES students focus on low-income students, because income data are a readily available data point and easily quantifiable. Few studies, though, look at wealth instead of income. A recent study by Su Jin Jez (2014), however, analyzes how low SES student access differs when wealth is considered. Jez (2014) found that students in the top wealth decile have a significant advantage in the college admissions process at top colleges, even compared to those in the second-to-top decile. When combining the effects of income and wealth, students in the top income decile are nearly twice as likely to be enrolled at more selective universities; and compared with the lowest four deciles, are roughly 4 to 8 times more likely to be enrolled in these selective colleges (Jez, 2014). Further, unlike similar advantages seen for the highest income and wealth groups in enrollment at less selective colleges, these advantages remain even when controlling for proxies for social and cultural capital (Jez, 2014). It is thus important to
note that because of the significant racial disparities in wealth in the United States (Wolff, 2012), any analysis that relies only on income and not on wealth will understate the socioeconomic disadvantage faced by African American and Latinx populations.

**Undermatching**

Not only are low SES students underrepresented at highly selective colleges, they are also more likely to “undermatch.” “Undermatching” refers to students who are academically qualified for a more selective college instead enrolling in a less selective institution. The concepts of “match” and “undermatch” are attributed to the Consortium on Chicago School Research, first discussed in a 2008 report (Roderick et al., 2008). The Consortium further developed the concept of undermatch in a 2009 study of students from Chicago Public Schools (CPS), which found that 71% of CPS students undermatch (Roderick, Nagaoka, Coca, & Moeller, 2009). Even among the most talented students – those who attend Chicago’s selective enrollment schools – approximately 62% of students undermatch (Roderick et al., 2009).

Further studies provide a greater sense of the prevalence of undermatching. In an examination of students in North Carolina, Bowen, Chingos, and McPherson (2009) found that 40% of students undermatch, and that students from families with lower incomes and less education are more likely to undermatch. Students who are first generation college students undermatch more than half the time, as do those from families in the bottom half of family income (Bowen et al., 2009). Using a national data set, Smith et al. (2013) similarly find that 41% of students undermatch, and that the students most likely to undermatch are low SES, first generation college, or rural.

The estimates of undermatch overall are somewhat lower by Belasco and Trivette (2015), whose study suggests 28% of students nationally undermatch. Among the most high-achieving
students, though, they find an undermatch rate of 58%, similar to the estimate among the Chicago selective enrollment schools (Belasco & Trivette, 2015). Further, the researchers find that the undermatch rate for high-achieving students is highest among low SES students and rural students (Belasco & Trivette, 2015). In a study of students over a three decade period from 1972 to 2004, Bastedo and Jaquette (2011) found that low-income students have long undermatched, and that undermatching has not improved over time at the top colleges. Smith et al. (2013) find that overall, the rate of undermatching has improved significantly over time, though Bastedo and Jaquette (2011) find that low-income student undermatching has not improved at the top colleges.

In further research by Engberg (2012) comparing high-achieving students from low- and high-income families, the low-income students are much less likely to end up at highly selective schools compared with their high-income counterparts: 63% enrollment versus 83%. The low-income high-achievers are still less likely to attend highly selective universities even when compared with moderately-achieving high-income students (Engberg, 2012). The findings of Reardon, Baker, and Klasik (2012) are similar: they find that students from the bottom income quintile are more than seven times less likely to enroll at a top college than those from the top quintile. Their summary is that “low- and middle-income students are likewise extremely underrepresented in the most selective colleges” (Reardon et al., 2012, p. 2).

It is worth noting that researchers have questions about the early research work on undermatching, and caution readers from seeing undermatching as an easily studied problem. These questions range from the philosophical and moral to the practical and econometric. For one, Tiboris (2014) draws a distinction between autonomous and non-autonomous undermatching, suggesting that only the latter is a problem of educational justice.
Acknowledging that overall, undermatching clearly contributes to problems of educational inequality, philosopher Tiboris suggests that at the level of the individual student’s college choice, the decision to undermatch is sometimes understandable and appropriate.

Bastedo and Flaster (2014) raise more practical concerns on undermatch research. First, they question how previous researchers have categorized the tiers of potential match colleges; while research has made clear that the most selective colleges confer significant benefits, the marginal benefits for colleges of moderate selectivity over those that are less selective are less clear, and perhaps on balance non-existent. Second, they question how accurate researchers’ models of the most selective college a student “could attend” are. With many selective colleges employing a holistic, rather than formulaic, admissions process, models based solely on quantitative inputs like SAT and GPA are only a rough estimate at best. Finally, the pair of researchers worry that the quantitative models based on SAT and GPA that are being promoted in this research are much more likely to diminish the enrollment of low-income students in selective universities, because of the entrenched disadvantages these students face in actually achieving high SATs and GPAs.

Rodriguez (2015), using methods from various previous studies on undermatching, shows that estimates of undermatching – both generally and across groups – can differ significantly depending on the assumptions made by the researcher. Among these assumptions are the ways in which categories of selectivity for colleges are defined, and methods in which qualifications and their match to colleges’ selectivity are determined. Depending on the choices made, the undermatch rate for the highest achieving students (for example) can be pegged at various numbers between 46% and 65%, and the overall undermatch rate for all students would range from 32% to 56% (Rodriguez, 2015).
Advantages of Selective College Enrollment

Undermatching is an issue because enrollment at a selective college conveys economic and other advantages to students. Because low-income students are much more likely to undermatch, this can be a factor in the perpetuation of broader measures of income inequalities (Reardon, 2013).

The advantages begin early in life, as top colleges help students to earn their degree. Looking at more than 10,000 twins who attend college, Smith (2013) found that enrolling in a more selective college significantly increases the odds of graduation; specifically, attending a college with an average SAT score 100 points higher results in a 5 percentage point higher graduation rate. Another more recent study by Shamsuddin (2016) found an even stronger correlation: attending a college with an average SAT score 100 points higher results in a 13 percentage point higher graduation rate. An earlier study shows the same pattern, with a 116-point difference in a college’s average SAT to increase graduation likelihood by 10% (M. C. Long, 2008).

These results are echoed across further studies that focus on disadvantaged groups. The highest scoring (SAT scores of 1200 or greater on a 1600-point scale) low-income students who undermatch would see an increase in chances of graduation of 10.2 percentage points, in a simulation by Howell and Pender (2016). Melguizo (2010), using data from the Gates Millennium Scholar Program, found that among low-income minority students, the difference between a less selective and more selective university is 5 to 12 percentage points of graduation rate. Alon and Tienda (2005) find similar results: that minority students’ likelihood of graduation increases with selectivity.
Following an increased likelihood of getting a bachelor’s degree, there is an increased likelihood of productive post-degree opportunities. Students at highly selective universities have extraordinary access to high status, high wage jobs (Rivera, 2015). They also are more likely to get graduate degrees: holding test scores constant, Carnevale and Rose (2004) find that attending a higher-tier undergraduate college increases access to graduate school, and thus lower unemployment rates.

This increased access to top jobs and graduate school leads to long term financial success. Brewer et al. (1999) found that, after controlling for other factors, attending a top college provides a “wage premium” – increased earnings over a lifetime – and that this premium has been increasing. Monks (2000) examines the same questions and comes up with nearly the same result, finding that students who attend top research universities have a wage premium over other students, including those who attend liberal arts colleges. A third study on the same question also found significant evidence of a wage premium for attending a more selective university (M. C. Long, 2008). The same wage premium phenomenon can be found beyond the United States as well. For example, Broecke (2012) found a wage premium for attending top British universities – another country with significant income inequality. Even in the one study that does not find a general wage premium for attending highly selective American colleges, the study still found a wage premium specific to first generation college students and minorities (Dale & Krueger, 2011).

In a study of post-college success, showing only raw results without any controls for factors like high school academic achievement, Chetty et al. (2017) find that the colleges that most often move students from being lower SES to being in the highest echelons of American wage earners are the well-resourced, highly selective colleges. Among a group of 12 “Ivy Plus”
schools, including the eight Ivy League colleges, Chicago, Duke, MIT, and Stanford, Chetty et al. (2017) find that students from the bottom quintile move to the top 1% of incomes between 6.9% and 18.5% of the time, depending on the school. Students from these same colleges who were in the bottom quintile of family income pre-college reached the top quintile post-college more than half of the time, the highest rate of any group of colleges studied (Chetty et al., 2017).

Further, in considering America’s colleges, there is a “rich get richer” phenomenon. In an analysis utilizing the Gini coefficient – a traditional measure of income inequality within nations – Davies and Zarifa (2012) find significant and increasing gaps in terms of financial resources between America’s most resourced colleges and the rest of its colleges. This suggests that the highly selective colleges are providing an increasing resource advantage to their students.

These resources can be seen in a study by Hoxby (2009), who found that in 1967, the most selective colleges spent 4.5 times as much on a per student basis on student support as the least selective colleges; and that in 2006, they spend 7.7 times as much. Translated into dollars, this represents $92,000 per student at the top colleges compared with $12,000 per student at non-selective schools. She also notes that the resource differential includes more student access (at least numerically, as measured by student to faculty ratio) to “better” faculty (by traditional measures, such as terminal degrees and scholarly research production), potentially improving student education (Hoxby, 2009).

The “Arms Race”

Low-income students have made improvements in their educational credentials over the past few decades. Even so, low-income students are now even further behind high-income students. Alon (2009) found that when admissions competition is increasing, as it has been for decades, the divide between low-SES and high-SES increases. In referring to this idea, Alon
(2009) uses the term “effectively expanding inequality;” Bastedo and Jaquette (2011) call it an “arms race.”

With increasing competition, admissions decisions are more often favoring students with exceptional academic credentials. At the top of the list of desired credentials appears to be very high standardized test scores, such as the SAT and ACT (Alon & Tienda, 2007; Bastedo & Jaquette, 2011; Bielby, Posselt, Jaquette, & Bastedo, 2014; Posselt et al., 2012). Unfortunately for low-income students, the highest test scores are disproportionately earned by wealthy students in the top income quartile (Carnevale & Rose, 2004).

Further, the top colleges are increasingly looking for more advanced high school coursework, such as calculus (Bastedo & Jaquette, 2011) and advanced science, credentials more often held by advantaged students (Posselt et al., 2012). Among the students with the highest test scores, the number of students who also took at least one Advanced Placement (AP) exam rose more than 25% between 1992 and 2004 (Bound, Hershbein, & Long, 2009). High-income students are significantly more likely to attend schools with AP courses (Klugman, 2012).

Selective colleges are also seeking extracurricular activities, which have become significantly important in the past decade (Posselt et al., 2012). High-income students have a number of advantages in gaining positions of extracurricular leadership. For example, high-income students are more likely to attend schools with more sports offerings (Klugman, 2012). Also, low-income students are more likely to need to spend extracurricular time working instead of doing activities, and part-time work does not impart any admissions advantage, according to an analysis by Espenshade et al. (2009).

Families with higher incomes are increasingly investing in their offspring’s educational growth, increasing the gap between the poor and the wealthy (Kornrich & Furstenberg, 2013;
One example of such an investment is private, paid test preparation, which significantly helps high-income students, and disadvantages low-income students (Buchmann, Condron, & Roscigno, 2010). In the 12 year period between 1992 and 2004, the number of high-scoring students taking test preparation classes increased 25% (Bound et al., 2009). Because entering class test scores are a factor in the influential college rankings lists, such as U.S. News and World Report, this increases the pressure on institutions to continue to place great value on the scores (Alon & Tienda, 2007). Another example of this phenomenon can be seen in the increased childcare time spent by mothers on their children by highly educated mothers, hypothesized to be attributable to increased college admission competition (Ramey & Ramey, 2010).

Even seemingly neutral admissions policies are subject to gaming by well-resourced families. When the University of Texas system introduced its Top 10% Plan in the late 1990s, one intention was to introduce greater diversity following a Fifth Circuit Court ruling in Hopwood v Texas that put a stop to race-based affirmative action in the state. Given the heterogeneity of high schools across the state, with some wealthy schools and some very poor schools, it could be expected that the plan would benefit low-income students. However, Koffman and Tienda (2008) found that because high-income families adapt to admissions changes, the result of the new program was actually to benefit not the low-income, but rather the high-income students.

The Choice to Apply

Students cannot enroll in a college unless they are accepted, and a student cannot be accepted unless they choose to apply. A number of studies find that many low-income students exit the enrollment process at this critical application stage. In three notable examples, Dillon
and Smith (2013), Smith et al. (2013), and Belasco and Trivette (2015) all use national data sets to find that qualified low-income students are most likely to be lost at the application stage, rather than the admissions stage or the enrollment choice stage. That is, the majority of qualified low-income students are not applying to top colleges, and thus cannot be admitted and then enroll.

In a major study, Hoxby and Avery (2012) come to a similar conclusion: that most of the qualified (>1300 out of 1600 on the SAT) low-income students apply to zero selective colleges. They find that the plurality of these students apply to non-selective universities, and that it is possible to identify the characteristics of students who are likely to undermatch: they call these students “one-offs” (Hoxby & Avery, 2012). According to the study, these low-income undermatching students are much less likely to be in a major metropolitan area and are more likely to be the only student like them in their high school (Hoxby & Avery, 2012). This isolation seems to be a factor in the students’ choice not to apply to top colleges. Pallais and Turner (2006) reach a different conclusion, finding that there may be little room for growth in low-income students at top colleges. They find that among high scoring (>1500 out of 1600 on the SAT) students with low incomes (<$35,000), there is a 77% likelihood of sending scores to a top 20 university; even among the low income students in the 1300-1400 band, the likelihood is greater than 50% (Pallais & Turner, 2006).

Among low SES students who graduate from high school and are qualified for college, only 65% even apply to any 4 year college, and only 80% of those actually enroll; for comparison, 87% of similarly qualified high SES students apply, and 89% enroll (Cabrera & La Nasa, 2001). The same study by Cabrera and La Nasa (2001) found that among all students,
parental involvement has a significant and positive effect on the 4 year college application process, but among low SES students it is not significant and actually appears to be negative.

Using a recent large data set, Buchmann et al. (2010) found that a number of factors significantly influence the decision to apply to college, and to apply to a more selective college. The factors that negatively influence applications to more selective colleges include first generation college status and perceptions of college cost (though not the actual financial aid), while wealth and parent encouragement for college entrance exams (the SAT) are positive influences (Buchmann et al., 2010). Wealth and income have significant effects on the choice to apply to college, with the high income students in the top decile, holding wealth constant, are roughly twice as likely to simply to apply to college as those students in the lowest four deciles of income (Jez, 2014).

While the number of applications submitted by all students have increased (Clinedinst, Hurley, & Hawkins, 2012), applications from high-income students and top college aspirants have outpaced others. One study found that low-income high-achieving students applied to, on average, 3.87 schools, compared to a 4.48 average for high-income, high-achieving students (Engberg, 2012). The same study found that the application set of the low-income high-achievers included fewer highly selective schools (52% of applications) than did the set for the high-income high-achievers (78%) (Engberg, 2012). Between 1983 and 2004, the proportion of students at top colleges who reported applying to 7 or more schools doubled (Bound et al., 2009). Further, undermatched students submit fewer applications than well-matched and overmatched students (Dillon & Smith, 2013).

Applying to selective colleges can be expensive, putting low-income students at a disadvantage. In 2001, nearly one-third of all students with SAT scores of at least 1500 (out of
sent their scores to 10 or more colleges, paying for each report beyond the fourth. In contrast, only about one in five students with SAT scores at 1500 or above sent just the four free reports that all students receive (Bound et al., 2009).

The four free reports may seem like a sufficient number, but researchers have found that even a small increase in the number of free score sends can make a big difference. In a natural experiment, Pallais (2013) found that when the ACT increased the number of free reports from three to four, many students increased the numbers of scores they sent from exactly 3 to exactly 4, and in the process significantly improved the range of applications submitted. Further, she found that low-income students were more likely to attend a selective college after the change (Pallais, 2013). A similar result was seen when the SAT increased their free score reports for low-income students from four to eight. Following this change, the low-income students increased their score sending – a proxy for college applications – and were, to a small degree, more likely to attend a more selective college (Hurwitz, Mbekeani, Nipson, & Page, 2016).

Other interventions have been found to make a difference in encouraging applications from high achieving low income students. In a randomized controlled study, Hoxby and Turner (2015) saw students in their treatment group be 56% more likely to apply to a match college compared with the control group. The treatment for these students was a data-rich mailing showing the advantages of more selective schools – including net (not list) price and outcomes relative to known, nearby options – and also including application fee waivers.

**College Counseling and Advice**

With the understanding that low-income students are “underapplying” to top colleges, a natural place to start would be with the student’s advising via the high school counselor. Unsurprisingly, less informed students are less likely to apply to four-year schools (K. J.
Robinson & Roksa, 2016), and more likely to undermatch (Dillon & Smith, 2013). Currently, the ratio of public high school students to school counselors is 436 to 1, though the ratio is better at private schools (Clinedinst, Koranteng, & Nicola, 2015). At one California public high school examined in a study by De La Rosa (2006), there were 734 seniors and just one college counselor.

Given the large public school counseling ratio, one answer seems to be finding smarter ways to advise students. Harvard professor Christopher Avery has, over the past decade, studied a number of counseling interventions with low-income students, with varying results.

In 2004, Avery worked on a Mellon Foundation-funded program called the College Opportunity and Career Help (COACH). In COACH, students from urban public schools were provided with additional admissions assistance from trained college student workers; these urban students were then compared with a group from an affluent suburban school. Avery and Kane (2004) found that while the urban and suburban students both knew how much attending college would benefit them, the urban students were less likely to have visited a college or met regularly with a school counselor, and also less likely to have completed crucial application steps such as taking entrance exams (SAT) and completing college applications.

In a 2010 paper, Avery published the results of a second counseling-based intervention. The students in this program had PSAT scores that put them in range of top colleges, attended a (non-feeder) public school, and lived in a low-income neighborhood. After dividing the students into a control and treatment group, students were offered ten sessions of personalized counseling with excellent professional counselors – the kind of personalized counseling for which some affluent students pay tens of thousands of dollars. Ultimately, however, many of the students did not follow the advice of their college counselors, resulting in only statistically insignificant
differences (with a small sample size) between the control and treatment groups, though members of the treatment group did submit more applications to highly selective colleges and were more likely to enroll in a top college (Avery, 2010).

Most recently, Avery released a 2013 paper looking at a college counseling outreach program in Minnesota called College Possible. College Possible provides test preparation and college application advising to low-income high school juniors and seniors. While the study found no evidence that the test preparation significantly helped, the college application advising did result in more applications to and more enrollment in both four-year colleges and selective four-year colleges (Avery, 2013).

One major difference between the College Possible program and Avery’s previous two programs was that the College Possible counselors are physically located in the student’s high school, and that participants in the program must agree to perform eight or more hours of community service for each of the two years of the program. It may be that the relatively small community service commitment resulted in greater buy-in to the program. It may also be that counselors who are in the high school are more valuable (or seen as more credible) than outside counselors.

Stephan and Rosenbaum (2013) studied a counseling program in the Chicago Public Schools which had similarities to the College Possible program. The Chicago program was also based in the high schools and aimed to assist students with the college process, though it was not limited to certain students and had no service requirement. The Chicago program was found to be somewhat successful in getting students to submit three or more applications and to complete the FAFSA, as well as enrolling in less-selective schools, but was not helpful in getting students to more-selective schools (Stephan & Rosenbaum, 2013).
Professional school counselors are not the only school staff who can assist students on their journey to college. Roderick, Coca, and Nagaoka (2011) – also studying the Chicago Public Schools – devised a measure of college-going climate in a school largely based on the degree to which teachers support an environment where students are encouraged to pursue college. Using this measure, and holding other factors constant, the researchers found that students in schools with a high teacher-based college-going climate were 12% more likely to enroll in a match college compared with those from low climates (Roderick et al., 2011).

**Application Recruitment and Outreach by Colleges**

While there has been some movement in recent years, for a long time few top colleges actively recruited low-income students. In an analysis by Carnevale and Rose (2004), the authors found that less than a quarter of four-year private universities reported recruiting low-income students, a percentage that was unchanged in nearly a decade. However, a later but less scientific study in 2015 reported that 74% of the 29 “more selective” private universities in a survey by the American Council on Education self-reported that they employed “targeted applicant recruitment” for students from low SES families (Espinosa et al., 2015, p. 57).

In a study that made national news, Hoxby and Turner (2013a) designed a low-cost recruitment strategy that effectively intervened to enroll low-income students at top colleges. Called “Expanding College Opportunities,” or ECO, the program offered qualified low-income students helpful information on the college application process, college costs, and graduation rates. It also provided students with application fee waivers. The cost of ECO is relatively low (compared with the costs of college counselors, or traveling to the dispersed areas where the students reside) at $6 per student.
Colleges recruit in different ways, and to different degrees. In her Harvard Ph.D. dissertation, Holland (2013) details how students from less savvy backgrounds, including first generation college students, were much more likely to conduct “haphazard” college searches. These students were heavily influenced by the assertive marketing techniques of the less- and non-selective, tuition-driven universities, and some students made poor choices due to the unequal amounts of marketing coming from the less selective (more marketing) and more selective (less marketing) (Holland, 2013).

Geography may be a factor in this “underrecruitment.” Highly selective colleges are geographically concentrated, primarily in the northeast, but also in the Midwest and on the west coast. However, Griffith and Rothstein (2009) found in their analysis that a disproportionate share of low-income students live far from these selective colleges. They do not find that distance matters more to low-income students – they find it matters equally to students across the socioeconomic spectrum – but that this structural factor may be suppressing applications to highly selective colleges by low-income students (Griffith & Rothstein, 2009). Hill and Winston (2010) concur with these findings, and suggest that highly selective colleges are underutilizing the ACT – the primary exam in the Midwest, the region with the largest share of low-income students – as an identification and recruitment tool.

Several national non-profit organizations play a role in helping low SES students apply to college; among those seen to be particularly effective are QuestBridge, Posse, and A Better Chance (Bial & Rodriguez, 2007). Each program provides application support and counseling, as well as application fee waivers, among other supports. QuestBridge and Posse partner directly with selective universities and provide significant proportions of the freshman class to partner colleges. QuestBridge students represent 11% of first year students at Amherst, 9% at Pomona,
and 4\% at Stanford (Leonhardt, 2014b). Posse represents roughly 3\% of enrolling first year students at colleges including Middlebury and Bucknell, and about 2\% of first year students at colleges like Pomona and Mount Holyoke (Posse Foundation, 2012).

**Admissions Decisions and Class-Based Affirmative Action**

While it is unclear to what degree admissions offices are currently providing an advantage to low-income students, many scholars believe that top colleges *should* be employing class-based affirmative action (Alon, 2009; Carnevale & Rose, 2004; Cashin, 2014; Kahlenberg, 1997).

There is conflicting evidence on the question of whether being a low-income applicant is a net positive, net negative, or a neutral factor. On one side, a recent study by Griffith and Rothstein (2009) found evidence that low-income students are selected less often than they should be. In a separate analysis, Carnevale and Rose (2004) also find that there is no preference for low-income students, who are placed at a disadvantage.

Bowen et al. (2005) find a more neutral result: that, relative to middle class students, low-income students have a slight admissions selection disadvantage, but also find the somewhat counterintuitive result that wealthy students are also at a slight disadvantage. They also find a slight advantage for first generation college student (Bowen et al., 2005). Overall, though, the effects they find are small.

In a major scholarly book, Espenshade et al. (2009) do find evidence of class-based affirmative action. Holding all other factors equal, they find that applicants from working class backgrounds receive an admissions preference equivalent to 70 points (out of 1600) on the SAT at private universities – though there is no preference seen at public universities (Espenshade et
al., 2009). (In this study’s dataset, “working class” is the self-reported grouping that accounts for nearly 90% of lower SES students.)

In 2015, the American Council on Education (ACE) delivered a report on diversity and admissions in which 64% of “private more selective” universities reported employing “additional admissions considerations” for low SES students (Espinosa et al., 2015, p. 57). Following the first Supreme Court decision of the *Fisher v. University of Texas at Austin* case in 2013, more schools reported an increase in considering SES as an admissions factor than any other diversity enhancement tactic; first generation college student status was a close second (Espinosa et al., 2015). Also, 27% of schools reported increased focus on SES in admissions after the first *Fisher* decision (Espinosa et al., 2015).

**College Cost and Aid**

One deterrent for low-income students may be the financial aspects of college. The concepts of college sticker price, net cost, and financial aid are complex, particularly for under-resourced low-income students.

For example, in a study of seven low-income Los Angeles high schools, De La Rosa (2006) found that aspiring college students had many misperceptions about college costs, aid, and affordability that serve to suppress college-going behavior. Similarly, Grodsky and Jones (2007), using a larger and more representative national data set, find that low SES and minority families make larger errors in understanding college costs; the authors also find general confusion about college costs across socioeconomic groups.

The financial aid process is complex, especially for first generation college students whose families have not previously experienced the process. For example, in one controlled experiment, Bettinger, Long, Oreopoulos, and Sanbonmatsu (2012) provided help with the Free
Application for Federal Student Aid (FAFSA) to low-income families. They found that the FAFSA assistance resulted in a two-fold increase in the likelihood of dependent students enrolling in a selective college (Bettinger et al., 2012).

Low-income students rarely, if ever, pay the stated tuition cost at highly selective colleges. For example, at Williams College, the well-endowed liberal arts school, the average low-income student pays less than $6,000 per year, and the net price declined significantly compared to the sticker price over the previous decade (Hill & Winston, 2006a). In fact, in the decade since the Hill and Winston study was published, the average cost of Williams for low-income students has declined even further, to $3,633 (NCES, 2016). In the now-decade old study, the average net price for a low-income student at the COFHE schools is less than $10,000 per year, a number which has been falling as a share of family income (Hill, Winston, & Boyd, 2005). The net prices for these colleges have fallen even further since (NCES, 2016).

Nevertheless, low-income students still experience “sticker shock” at the listed prices. While the influence of listed tuition before aid declined to insignificance by 1992 for the overall national cohort, sticker price still plays a major role as a negative influencer for low-income students (B. T. Long, 2004). Compounding the issue of sticker shock is the finding that many schools raise their tuition price not to increase revenues from low- and middle-income students, but rather with the intention of signaling quality to consumers, especially savvy, high-income students (Bowman & Bastedo, 2009).

Students and families do not always act rationally with regard to the economics of the college decision. For example, Avery and Hoxby (2004) found that low-income students are more likely to make economically poor college decisions. In the Avery and Hoxby (2004) study, approximately 30% of students acted irrationally in their college choice, with low-income
students making economically irrational decisions more often with decisions such as being overly swayed by named scholarships.

Cohodes and Goodman (2012) concur with Avery and Hoxby’s finding that low-income students are unduly influenced by named scholarships. They look at one of these scholarships, the John and Abigail Adams Scholarship in Massachusetts, which promises to cover the modest tuition but not the hefty fees of public universities in Massachusetts for high-achieving students. Cohodes and Goodman (2012) find that the disproportionately low-income group of students who took this offer instead of an economically more promising offer from a higher quality university gave up, on average, $100,000 in future income, and also decreased their chances of graduating on time.

Students do not always respond inappropriately to financial aid programs. In 1998, Princeton University made a major financial aid change, where aid that was previously given in the forms of loans was replaced with grant aid; the program was frequently referred to as “no-loan,” and was frequently copied by other universities in the decade that followed. In a study of an anonymous university – from the context, it is almost certainly Princeton – Linsemeier, Rosen, and Rouse (2006) find that low-income and minority students responded to Princeton’s no-loans initiative positively, increasing the likelihood of enrollment.

Dillon and Smith (2013) found significant evidence of undermatching in their large, national data set, and attribute a fair share of that undermatching to financial issues: they find that high-income students are much less likely to undermatch, compared with low-income students, who are quite likely to undermatch. Better financial aid programs, such as no-loan policies, have been found to improve matching (Waddell & Singell Jr, 2011).
Individual College Interventions

While on the whole it is clear that most American colleges are not taking significant action, some schools have put forth successful interventions, including a number of highly selective private colleges and flagship public universities. These successful programs can serve as inspiration and a guide for other universities seeking to improve their low-income student representation.

In 2004, Harvard University launched a program called the Harvard Financial Aid Initiative (HFAI). HFAI’s stated goal was to increase enrollment from low-income students. To do so, Harvard improved its financial aid programs and enlisted current low-income students to do direct outreach with prospective low-income students. In the first year, HFAI was successful, increasing the number of low-income ($60,000 or less in annual income) students from 14.9% to 16.5% (Avery et al., 2006). The increase was largely due to an increase in the proportion of low-income students in Harvard’s applicant pool, which can be attributed to the significant publicity that HFAI received as well as increased application outreach; there was no evidence of any additional admissions preference or extra class-based affirmative action (Avery et al., 2006).

In the same year, the University of Virginia (UVA) launched its AccessUVA initiative. This program focused on students whose families’ annual incomes were less than 200% of the poverty line. These students received more recruitment attention from the UVA admissions office, and admitted students would see their full financial need met only by grants and not by loans. Unlike at Harvard, though, a study by Pallais and Turner (2007) suggests that increased applications were not the driving force for improved low SES enrollment, but rather an improved proportion of admitted students accepting the admission offer.
Compared with the Ivy League and other top schools, the University of California (UC) schools enroll proportionately many more low-income students. XXX suggest three reasons for this: the perception of the Ivy League as being culturally elite; the perception of the Ivy League as being expensive (even though their net costs may be cheaper for many low-income students); and comparative distance to low-income students. Further, the authors believe that the success at the UC schools – including Berkeley, by any measure a top college – is due to a system-wide mandate, an admissions process looking to affirmatively admit low-income and other disadvantaged students, and a lower perceived cost (Douglass & Thomson, 2012). In another look at UC’s success, Timar, Ogawa, and Orillion (2004) find that UC’s broad and deep outreach programs, enacted in the wake of a statewide ban on race-based affirmative action, have a major impact; the university’s strong commitment to these programs has created success.

In a case study of leading liberal arts school Amherst College, Rubin (2011) found the institution has been a leader in enrolling low-income students by looking to its mission and employing leadership at the highest levels. Burd (2013) concurs, calling out Amherst as “leading the pack” (p. 8) in terms of wealthy schools enrolling low-income students. Like Rubin, Burd (2013) credits leadership at the presidential level for the college’s success.

Seeing an alignment with the school’s values, the University of Washington (UW) implemented class-based affirmative action (Ballinger, 2007). In its implementation, UW did away with its test score-based quantitative admissions index, and additionally provided admissions readers with further contextual information for their holistic review, including parent education, school poverty, and family income status (Ballinger, 2007).

In 2008, the University of Colorado at Boulder (CU), facing a potential ballot initiative banning race-based affirmative action (which, ultimately, did not pass), implemented class-based
affirmative action in their undergraduate admissions process. The CU admissions office introduced a “Disadvantage Index” and a “Overachievement Index” into their admissions process to better identify students who have achieved well for their context (Gaertner & Hart, 2013, p. 379). These indices quantify not just a student’s observed academic qualifications, but also academics in context of socioeconomic disadvantage. These indices are then used for the purpose of admission, elevating the odds of admission for low SES applicants (Gaertner & Hart, 2013).

**Summary**

The literature has clearly revealed that low-income students are underrepresented at America’s most selective colleges. Proportionally, there are more talented, poor students in the country than there are in the best schools. This phenomenon, known as undermatching, poses a problem for economic inequality and income stratification in the United States. The issue is drawing increasing attention, both from policy and education circles.

A number of factors contribute to this problem. Primary among them is low-income students not initiating and completing applications to top colleges. Several factors influence this application deficit, including less access to college knowledge compared to high-income students; a low level of recruitment of low-income (especially rural low-income) students by top colleges; and a college cost and aid process that many students and families find overly confusing.

Considering the stages of Radford’s (2013) College Destination Process, the impact of the *application* phase is clear. However, the evidence on the following stage, *admissions*, is mixed, with studies on both sides of the question of whether low-income students receive an
advantage or disadvantage in the selection process. This study aims to better answer this question. Further, this study will examine the final stage, matriculation.
Chapter Three: Research Design

This study aims to examine how different stages of the college admissions process contribute to class inequities in enrollment. Specifically, the study examines the following two questions:

1. To what degree, if any, do admissions offices provide an admissions advantage to students from low socioeconomic status backgrounds, holding other factors constant?
2. To what degree, if any, does being a student from a low socioeconomic status background impact matriculation at a highly selective college, holding other factors constant?

The study uses a correlational approach in examining a large data set from a consortium of private, highly selective colleges. Using a logistic regression analysis in SPSS, the study aims to uncover the direction and magnitude of correlation between admission/enrollment and first generation college student status.

Research Design

This study utilizes a correlational approach. A correlational design is appropriate for this study as it looks to explore if there is a significant relationship, and if so to what extent, between a dependent and several independent variables (Fraenkel, Wallen, & Hyun, 2015). Specifically, the study will consider the relationship between a number of variables, including admission to and enrollment at one of a set of highly selective universities, first generation college status, and a set of other variables used in admission decisions related to achievement and demographics.

The correlational approach provides a mechanism to illuminate each of the research questions. Previous work on this research question has utilized a similar correlational approach
to this proposed study with great success. For example, Espenshade et al. (2004) showed that for a set of highly selective universities, socioeconomic status, legacy status, and minority status all provide an admissions advantage.

By showing the relationship between admission and first generation status, the study can see the relative probability of a first generation student gaining admission. This can help to understand the likelihood of universities are providing an admission advantage to these students, though it cannot explicitly say that any relative disadvantage or advantage is caused by the first generation college status. Similarly, by showing the relationship between enrollment and first generation status, the study can see the relative probability of a first generation college student matriculating at the colleges.

**Population and Sampling**

This study utilizes the entire set of freshman applicants to a set of 14 highly selective universities in 2015, the most recent year available. The data set is produced by a consortium of private, highly selective universities. Generally, this consortium does not allow their name to be listed in studies which utilize their data. Data from this same consortium has been used previously in several notable studies (Hill & Winston, 2006b; Hurwitz, 2011).

The schools in this study’s data set are ranked as many of the best in the country. The 14 colleges are all ranked among the top 50 national universities or liberal arts colleges, according to the 2016 *US News & World Report* rankings of “best colleges” (Morse, Brooks, & Mason, 2015), and more than half are among the top 10. Further, when considering schools with the financial resources to best support low-income students, these schools stand out: the schools all have endowments per student of greater than $100,000; more than half have endowments per
student greater than $400,000. Compare these numbers with the median private, four-year non-profit school’s endowment per student, which was $32,400 in 2013-2014 (Ma, Baum, Pender, & Welch, 2016).

Studying the wealthiest and highest ranked colleges is important for this work because it is these colleges that can provide greater resources to all students, including low-income students (Hoxby, 2009). This has long been true, but is even more true today. Hoxby (2009) found that in 1967, the most selective colleges spent 4.5 times as much on a per student basis on student support as the least selective colleges; in 2006, they spend 7.7 times as much. In dollars, this is $92,000 per student versus $12,000 per student. Included in this measure is faculty who are “better” by traditional measures (percent with Ph.D.s, scholarly research production), as well as more access (at least numerically) as measured by student to faculty ratio (Hoxby, 2009).

In summary, the consortium schools are, as Hill et al. (2005) write, “a population with importance quite out of proportion to its numbers, both because [they] are highly visible—to the public, policy makers, and other schools—and because of the social importance of low-income access to these schools” (p. 772).

**Data Collection**

**Instrument.** This study will utilize the consortium’s annual admission survey. As a condition of membership in the consortium, the member schools agree to provide, in an anonymous and confidential fashion (names, social security numbers, etc. are not provided), the data on all applicants each year. The member colleges provide the data as unit records: each student is a "row" of data, with various data fields provided for each student. The consortium data are a private data set to which researchers may request access. For this study, access has been granted by 14 schools in the consortium.
The consortium data represents a complete set of the applicants to each of the participating member schools. The data set will allow the research questions to be analyzed directly. In this study of class inequity, the first generation college student status variable (nominal, dichotomous) will be used as the key independent variable.

For the first research question exploring the “admissions stage,” the crucial variable is “admission decision” (nominal, dichotomous). It is yes or no, 0 or 1. A 1 means admitted to the school in question; 0 means not admitted. Similarly, for the second research question exploring the “enrollment stage,” the crucial variable is “enrollment decision” (nominal, dichotomous). It is yes or no, 0 or 1. A 1 means the student enrolls at the school in question; 0 means the student did not enroll.

Other variables in the data set would be used to control for differences in demography, opportunity and preparation. These include SAT and ACT scores (interval), race/ethnicity (a set of several nominal, dichotomous variables), citizenship status (nominal, dichotomous), legacy status (nominal, dichotomous), and early application (nominal, dichotomous).

**Procedures.** At the conclusion of each academic year, institutional researchers at each consortium member institution provide unit record data on the previous year’s admissions cycle. The central consortium office aggregates and stores the data. Some reports are produced annually for the members for benchmarking and other purposes. Some of the data are also available to approved researchers.

**Data Analysis**

Because of consortium data validation and cleaning procedures, the data was provided with most data already properly coded. The analysis will only consider students with US
citizenship or permanent residency, and not international students. This is because most universities treat international students differently in their admissions processes; most selective colleges, through “need aware” admissions policies, explicitly favor international students who can afford to pay full tuition, disadvantaging needy international students (Lucido, 2014). Further, those rankings that factor in socioeconomic status only consider low-income Americans (Leonhardt, 2014a; Morse et al., 2015).

**Independent variables.** Most of the independent variables are categorical and dichotomous, with a 1 representing “yes” and a 0 representing “no:” first generation college, legacy, and early application. Other categorical dichotomous variables include the indicators for gender as well as for each of several races/ethnicities: African American, Asian American, Caucasian/White, Hispanic/Latinx, and Native American. The academic performance variable, test scores, is a continuous variable.

The variable first generation college will be used as a proxy for socioeconomic status. Socioeconomic status has been found to be a consideration in admissions decisions (Bowen et al., 2005; Espenshade et al., 2009; Griffith & Rothstein, 2009; Perna, 2006b). Demographic characteristics such as gender (Baum & Goodstein, 2005; Delahunty Britz, 2006) and race and ethnicity (Alon & Tienda, 2007; Espenshade et al., 2004; Posselt et al., 2012) are significant factors in selective college admission. Admissions offices also give preference to children of their alumni/ae, called “legacies” (Espenshade et al., 2004; Hurwitz, 2011), and early applicants (Avery & Levin, 2010; G. Chapman & Dickert-Conlin, 2012).

**Dependent variables.** Each of the dependent variables are dichotomous: admission decision (1 for admitted, 0 for not admitted) and enrollment (matriculation) decision (1 for
enrolling, 0 for not enrolling). Admission decision variable will be present for all applicants. Enrollment decision variable will only be used and examined for students who were offered admission. Students who withdrew their application before a final decision is delivered will be excluded from the analysis.

**Analytic strategy.** To analyze the research questions in this study, logistic regression is used. Logistic analysis can be used to produce odds ratios for each independent variable with respect to the dependent variable, allowing each factor’s effect size to be seen, accounting for the other factors (Tabachnick & Fidell, 2013). In this way, the inherent differences in the two groups – for example, lower test scores on average for first generation college students – can be eliminated as sources of the core problem, and differences not accounted for in the variables can be focused on. Dummy variables for institutional fixed effects will be utilized to account for college differences in admission rate and yield rate. This same analytic method has been used in other key studies on the topic of admission preferences, notably including Espenshade et al. (2004). This study will look to build off of this earlier, now dated, study. The analysis will be conducted on IBM SPSS Statistics Version 24.

To utilize logistic regression, four assumptions must be satisfied (Laerd Statistics, 2013). First, the dependent variables must be dichotomous. In this dataset, they are, so assumption 1 is met. Second, the independent variables are continuous or categorical. With this dataset, as seen earlier in the "independent variables" section, the set of independent variables include only categorical and continuous variables, so assumption 2 is met. Third, there should be "independence of observations and the dependent variable should have mutually exclusive and exhaustive categories" (Laerd Statistics, 2013). In this dataset, each case is independent, and the dependent variables are mutually exclusive and exhaustive: an applicant can either be admitted
or not, and an admitted student can either enroll or not. The final assumption, which requires linearity between the continuous independent variables (in this dataset, the only continuous variable is SAT score) and the logit transformation of this independent variable, will be tested with the data prior to the analysis.

Choosing a logistic regression as the type of regression produces coefficients for each of the variables, with values between 0 and 1 (inclusive). The coefficients can then be converted to odds ratios, with the relative probability for success of one group to be compared against a baseline group (Tabachnick & Fidell, 2013). Odds ratios above 1.0 mean that the comparison group is advantaged relative to the baseline group, while an odds ratio less than 1.0 means the comparison group is disadvantaged relative to the baseline group. The analysis will also provide the level, if any, of statistical significance of the odds ratios.

While the logistic regression can statistically control for the variables in the data, nothing can compensate for variables not included in the data. Other factors, such as community service involvement, quality of essays, and strength in an admissions interview, are not included in the data and could account for some of the differences seen. However, the literature review suggests that many of the most important factors for admission are included in the data set, and many of the non-included variables are very subjective and difficult (if not impossible) to measure.

Validity, Reliability, & Generalizability

Internal validity. Internal validity “means that any relationship observed between two or more variables should be unambiguous as to what it means rather than being due to ‘something else’” (Fraenkel et al., 2015, p. 167). Fraenkel et al. (2015) identify ten threats to internal validity. However, because the study is comprehensive (using the entire set of applicants to the universities), does not rely on a survey but rather utilizes standard reported data, and represents a
snapshot in time of data, these threats are not a factor. Previous peer reviewed studies using data from this data set such as (Hurwitz, 2011) suggest no significant threats to internal validity.

**Reliability.** Reliability “refers to the consistency of the scores obtained” (Fraenkel et al., 2015, p. 155). The data will come from the universities, and their data will come from various sources, including the applicant, the applicant’s school, and the testing agency. Each university is expected to provide data in the standard consortium form, using standard methods agreed to by all consortium members. Previous peer reviewed studies using data from this data set such as (Hurwitz, 2011) suggest that the reliability of the data reported by the universities is strong.

On the individual record level, there could be some misreported data. Because not every element of every student’s application is double checked for accuracy, some erroneously reported data could get through. For example, a student might not report an immigrant parent’s overseas college attendance, triggering a “first generation college” status that would be, according to the definition, incorrect. However, if the admissions office has no reason to believe that such a data element is incorrect, it will act according to the reported data. Thus, even though the student is not technically “first generation college,” because the admissions office treated the student as a first generation college student, it is appropriate to look at the student as they were considered, not as they really are.

**Generalizability.** To generalize means to "apply the findings of a particular study to people or settings that go beyond the particular people or settings used in the study" (Fraenkel et al., 2015, p. 104). First, considering ecological generalizability, or "the degree to which the results of a study can be extended to other settings or conditions" (Fraenkel et al., 2015, p. 106), there is reason to believe that in a different environment, the results would be different. For
example, if the influential *US News* rankings were to more heavily include socioeconomic diversity, admission results might change accordingly.

Considering the population generalizability, or “the degree to which a sample represents the population of interest” (Fraenkel et al., 2015, p. 104), there is good reason to believe that while not all highly selective universities are included in the data set, that it should be generalizable to the set of private, national, highly selective universities as a whole. As discussed previously, the data includes many of the most selective private research universities and liberal arts colleges. While the results cannot be extended to any *specific* university outside of the set being studied, it is reasonable to believe that these results generally represent the status at private, national, highly selective universities as a whole. There are not significant policy, process, or mission differences at the private, national, highly selective universities in the sample and outside the sample. However, the results probably cannot be generalized to colleges beyond the set of private, national, highly selective universities, because there are too many differences in policy, process, and mission.

**Ethical Considerations**

The college applicants studied in this research were not put at any risk. The consortium data set qualifies as being in the exempt category for human subject research protection, and was deemed exempt by the Northeastern University Institutional Review Board. The consortium data set is existing data which is not publicly available and in which the research subjects cannot be identified. And even though the data was found to be exempt by the Institutional Review Board, great pains were taken to protect the data in accordance with the standards of educational research and of the consortium.
Summary

This study utilizes a private consortium dataset of admissions applicants and decisions to a set of highly selective universities. The dataset includes records for each student application to the universities, including demographic factors like gender and race, socioeconomic factors like first generation college status, academic factors like test scores, and other admission considerations like early applications. The study answers the research questions by utilizing a logistic regression analysis. This analysis reveals correlation between socioeconomic status and two important stages of the college destination process, admissions and matriculation, separate from other confounding admission and enrollment factors, such as test scores and race.
Chapter Four: Results

This study’s purpose is to show what relationship, if any, exists between socioeconomic status and selective college admission. This chapter presents the results of this analysis as well as descriptive statistics for the universities participating in the study. The results are presented in the aggregate for the set of participating universities, followed by a look at the universities as individual entities.

Data Cleaning and Transformation

The consortium’s data are clean and well coded, yet some minor data transformation was required before proceeding with the analysis. For example, the consortium data presents the admissions variable at greater detail than is necessary for this study. It breaks down admitted students into those that were admitted early and regular (including waitlist), and those that did and did not matriculate. For this analysis, all students were collapsed into a dichotomous variable, with a 0 representing students who were not admitted, and a 1 representing those who were admitted.

The consortium data also presents the enrollment variable at greater detail than is necessary for this study. It breaks down enrolling students into those that enrolled from the early pool, those that enrolled from the regular/waitlist pool, and those that did and did not enroll. For this analysis, all students were collapsed into a dichotomous variable, with a 0 representing students who did not enroll, and a 1 representing those who did enroll.

Similarly, the application timing is presented at greater detail than necessary. The data in the dataset shows students who applied not only early and regular, but also those who were transfer applicants, those who applied in previous years but took a “gap year” and are enrolling
in the data year, and those who submitted an application but who later withdrew their application before a decision was rendered. For this analysis, all students were collapsed into a dichotomous variable, with a 0 representing students who applied regular, and a 1 representing those who applied early. Transfer students, students who applied in a previous year, and students who withdrew their application before a decision was rendered are excluded in this analysis. Also, as previously discussed, only US citizens and permanent residents are included in this analysis; international citizens are excluded.

In the data set, some students have ACT scores and others have SAT scores. Using a standardized concordance table, ACT composite scores were converted into SAT composite scores. The choice to convert ACT into SAT, rather than SAT to ACT, was made because more students in the data set provided SAT scores, and because most studies in the field use SAT scores for primary analysis (Avery & Levin, 2010; Espenshade et al., 2004; Hill & Winston, 2006b; Hurwitz, 2011). Thus, the ACT and SAT scores will be able to be collapsed into one variable, “test scores,” with a student’s performance presented in 50-point blocks of SAT scores.

Following all data transformations, the set of variables used (aside from the institutional fixed-effect dummy variables) and the possible values for each variable can be seen below in Tables 1 and 2.

Table 1

<table>
<thead>
<tr>
<th>Independent Variables</th>
<th>Possible Values</th>
</tr>
</thead>
<tbody>
<tr>
<td>first generation college</td>
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</tr>
<tr>
<td>legacy</td>
<td>0 (not legacy), 1 (legacy)</td>
</tr>
<tr>
<td>early application</td>
<td>0 (regular applicant), 1 (early applicant)</td>
</tr>
<tr>
<td>African American</td>
<td>0 (does not identify as African American), 1 (does identify as</td>
</tr>
<tr>
<td></td>
<td>African American)</td>
</tr>
<tr>
<td>Asian American</td>
<td>0 (does not identify as Asian American), 1 (does identify as</td>
</tr>
<tr>
<td></td>
<td>Asian American)</td>
</tr>
</tbody>
</table>
Asian American) 0 (does not identify as Caucasian), 1 (does identify as Caucasian)
Hispanic/Latinx 0 (does not identify as Hispanic/Latinx), 1 (does identify as Hispanic/Latinx)
American Indian or Alaska Native 0 (does not identify as Native American), 1 (does identify as Native American)
Native Hawaiian or Other Pacific Islander 0 (does not identify as Native Hawaiian), 1 (does identify as Native Hawaiian)
gender 0 (male), 1 (female)
test scores 1600 (SAT score or ACT equivalent of 1560-1600), 1550 (SAT score or ACT equivalent of 1510-1550), 1500 (SAT score or ACT equivalent of 1460-1500), 1450 (SAT score or ACT equivalent of 1410-1450), 1400 (SAT score or ACT equivalent of 1360-1400), 1350 (SAT score or ACT equivalent of 1310-1350), 1300 (SAT score or ACT equivalent of 1260-1300), 1250 (SAT score or ACT equivalent of 1210-1250), 1200 (SAT score or ACT equivalent of 1160-1200), 1150 (SAT score or ACT equivalent of 1110-1150), 1100 (SAT score or ACT equivalent of less than or equal to 1100)

### Table 2

<table>
<thead>
<tr>
<th>Dependent Variable</th>
<th>Possible Values</th>
</tr>
</thead>
<tbody>
<tr>
<td>Admitted</td>
<td>0 (not admitted), 1 (admitted)</td>
</tr>
<tr>
<td>Enrolled</td>
<td>0 (did not enroll), 1 (enrolled)</td>
</tr>
</tbody>
</table>

### Descriptive Statistics for Study Population

Across the 14 schools, there are 208,507 valid cases. This number represents all applicants after invalid cases (international students and students who did not receive a freshman admission decision in the 2015 application year) are excluded. Tables 3 and 4 show the distribution of these cases across each of the variables. Note that the race/ethnicity variables add up to greater than 100% because students can identify with more than one race/ethnicity.
Table 3

Descriptive Statistics for Dichotomous Independent Variables

<table>
<thead>
<tr>
<th>Independent Variable</th>
<th>No (variable=0)</th>
<th>Yes (variable=1)</th>
</tr>
</thead>
<tbody>
<tr>
<td>First generation college</td>
<td>169,979 (81.5%)</td>
<td>38,528 (18.5%)</td>
</tr>
<tr>
<td>Legacy</td>
<td>201,185 (96.5%)</td>
<td>7,322 (3.5%)</td>
</tr>
<tr>
<td>Early application</td>
<td>180,090 (86.4%)</td>
<td>28,417 (13.6%)</td>
</tr>
<tr>
<td>African American</td>
<td>187,383 (89.9%)</td>
<td>21,124 (10.1%)</td>
</tr>
<tr>
<td>Asian American</td>
<td>151,636 (72.7%)</td>
<td>56,871 (27.3%)</td>
</tr>
<tr>
<td>Caucasian/white</td>
<td>94,667 (45.4%)</td>
<td>113,840 (54.6%)</td>
</tr>
<tr>
<td>Hispanic/Latinx</td>
<td>182,481 (87.5%)</td>
<td>26,026 (12.5%)</td>
</tr>
<tr>
<td>American Indian or Alaska Native</td>
<td>204,862 (98.3%)</td>
<td>3,645 (1.7%)</td>
</tr>
<tr>
<td>Native Hawaiian or other Pacific Islander</td>
<td>207,547 (99.5%)</td>
<td>960 (0.5%)</td>
</tr>
<tr>
<td>Gender (female)</td>
<td>99,369 (47.7%)</td>
<td>109,138 (52.3%)</td>
</tr>
</tbody>
</table>

Table 4

Descriptive Statistics: Test Score Frequency

<table>
<thead>
<tr>
<th>SAT Score</th>
<th>Frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td>1560-1600</td>
<td>8,609 (4.1%)</td>
</tr>
<tr>
<td>1510-1550</td>
<td>24,821 (11.9%)</td>
</tr>
<tr>
<td>1460-1500</td>
<td>29,139 (14.0%)</td>
</tr>
<tr>
<td>1410-1450</td>
<td>27,240 (13.1%)</td>
</tr>
<tr>
<td>1360-1400</td>
<td>30,728 (14.7%)</td>
</tr>
<tr>
<td>1310-1350</td>
<td>18,133 (8.7%)</td>
</tr>
<tr>
<td>1260-1300</td>
<td>14,513 (7.0%)</td>
</tr>
<tr>
<td>1210-1250</td>
<td>11,103 (5.3%)</td>
</tr>
<tr>
<td>1160-1200</td>
<td>9,864 (4.7%)</td>
</tr>
<tr>
<td>1110-1150</td>
<td>5,671 (2.7%)</td>
</tr>
<tr>
<td>1100 or lower</td>
<td>13,435 (6.4%)</td>
</tr>
<tr>
<td>No scores provided</td>
<td>15,251 (7.3%)</td>
</tr>
</tbody>
</table>

The test scores of the applicants to these 14 schools are extremely high. Nationally, for high school students graduating in 2015, the mean SAT score on a 1600-point scale was 1006, and the 75th percentile was 1160 (College Board, 2015a). The mean score for the students in this study is 1387, which would represent scores above the 90th percentile of all test takers (College Board, 2015b). The standard deviation of SAT scores in the data set is 153.
Table 4 also shows 15,251 cases where no SAT or ACT scores were provided. Most of these cases are at the three colleges in the sample set that have an SAT/ACT-optional admissions policy – that is, they do not require all applicants to provide SAT or ACT scores. The remaining colleges in the sample set are not SAT/ACT-optional.

As seen in Table 5, these schools are very selective, with an admit rate for the valid cases of 15.4%. Nationally, the average freshman admission rate in 2014 (the most recent year available) was 65.8% (Clinedinst et al., 2015). These schools also enroll (yield) a significant proportion of the students they admit, 43.1% of them. Nationally, the average freshman yield rate in 2014 was 36.2% (Clinedinst et al., 2015).

Table 5

<table>
<thead>
<tr>
<th>Dependent Variable</th>
<th>No (variable=0)</th>
<th>Yes (variable=1)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Admitted</td>
<td>176,307 (84.6%)</td>
<td>32,200 (15.4%)</td>
</tr>
<tr>
<td>Matriculated</td>
<td>18,331 (56.9%)</td>
<td>13,869 (43.1%)</td>
</tr>
</tbody>
</table>

Relative to the overall admit rate, first generation students are admitted less frequently. First generation students in the data set are admitted at an 11.6% rate, lower than the overall rate of 15.1% and the rate for non-first generation students of 15.9%. When these students are admitted, though, they matriculate at a higher rate, 46.2%, compared with a 43.2% overall yield rate and a 42.7% yield rate for non-first generation students.

Table 6

<table>
<thead>
<tr>
<th>Variable</th>
<th>Admission Percentage (Admit Rate)</th>
<th>Enrollment Percentage (Yield Rate)</th>
</tr>
</thead>
<tbody>
<tr>
<td>First generation college students</td>
<td>11.6%</td>
<td>46.2%</td>
</tr>
<tr>
<td>Non-first generation college students</td>
<td>15.9%</td>
<td>42.7%</td>
</tr>
</tbody>
</table>
Participating Institutions’ Descriptive Statistics

While the data agreements with the consortium and the individual schools preclude the publishing of identifying statistics, some descriptive statistics about the set of schools can be shared. Overall, the schools can be described as highly selective in their admissions and very well resourced.

All 14 schools in the sample have admission rates of less than 50%. Nationally, fewer than one in five colleges admit fewer than half of their applicants (Clinedinst et al., 2015). Among the 14 colleges in the data set, the median admission rate is less than 15% (Barron's, 2016).

Educational researchers commonly characterize the selectivity of the colleges they study using the ratings in Barron’s Profiles of American Colleges (Griffith & Rothstein, 2009; Hearn & Rosinger, 2014; Hurwitz et al., 2016; Posselt et al., 2012; Roderick et al., 2011; Smith et al., 2013). All 14 schools are rated as “Most Competitive,” the highest category; nationally, only 52 schools received this designation (Barron's, 2016).

These 14 schools have significant financial resources. All of the schools in the set have an endowment of at least $1 billion; the median endowment exceeds $3 billion; and the total endowment assets of the universities exceed $40 billion (NACUBO, 2015).

Research Questions

Before running the models for each of the research questions, a test is run to ensure that the assumptions of logistic regression are met. It requires linearity between the continuous independent variable (in this dataset, the only one is SAT score) and the logit transformation of
the dependent variable. For the models for both research question 1 and research question 2, this assumption was met, as the interaction term is not significant in either model.

Table 7

<table>
<thead>
<tr>
<th>Independent Variable</th>
<th>Significance</th>
<th>Model</th>
</tr>
</thead>
<tbody>
<tr>
<td>ln(SAT) x SAT</td>
<td>.376</td>
<td>#1 (admission)</td>
</tr>
<tr>
<td>ln(SAT) x SAT</td>
<td>.655</td>
<td>#2 (matriculation)</td>
</tr>
</tbody>
</table>

The results of the analyses for both research questions are presented as odds ratios. An odds ratio statistic can be interpreted as the relative increase in likelihood of the outcome – for question 1, admission, and for question 2, enrollment – for cases where that condition is present relative to those where the condition is not present. For example, if research question 1 showed an odds ratio of 2.00 for first generation college students, it would indicate that first generation college students are twice as likely to be admitted as non-first generation college students, holding constant the other factors in the model (race, gender, legacy status, early application, test scores). Similarly, if research question 2 showed an odds ratio of 0.25 for first generation college students, it would indicate that first generation college students are a quarter as likely to enroll at the college as non-first generation college students, holding constant the other factors in the model.

**Question 1.** The first research question asks, to what degree, if any, do admissions offices provide an admissions advantage to students from low socioeconomic status backgrounds, holding other factors constant? The logistic regression analysis for this question showed an odds ratio greater than 1.0 for the independent variable first generation college. The odds ratio 1.403 is significant at a p<.001 value. This suggests that, on the whole, holding the
other factors constant, this set of colleges is providing an admission advantage for first
generation college students. For the model performance and model usefulness, refer to Table A1,
The Omnibus Tests of Model Coefficients and Table A2, Model Summary, in Appendix A,
respectively.

Table 8

<table>
<thead>
<tr>
<th>Independent Variable</th>
<th>Odds Ratio</th>
<th>Significance</th>
</tr>
</thead>
<tbody>
<tr>
<td>First generation college</td>
<td>1.403***</td>
<td>.000</td>
</tr>
</tbody>
</table>

*** p<.001

**Question 2.** The second research question asks, to what degree, if any, does being a
student from a low socioeconomic status background impact matriculation at a highly selective
college, holding other factors constant? The logistic regression analysis for this question again
showed an odds ratio greater than 1.0 for the independent variable first generation college. The
odds ratio, however, is only slightly higher than 1, at 1.014, and is not statistically significant.
For the model performance and model usefulness, refer to Table B1, The Omnibus Tests of
Model Coefficients and Table B2, Model Summary, in Appendix B, respectively.

Table 9

<table>
<thead>
<tr>
<th>Independent Variable</th>
<th>Odds Ratio</th>
<th>Significance</th>
</tr>
</thead>
<tbody>
<tr>
<td>First generation college</td>
<td>1.014</td>
<td>.731</td>
</tr>
</tbody>
</table>

**Results by School**

This study not only looked at the results in aggregate, but also looked at the results on a
school-by-school basis. Overall, the study showed an odds ratio of 1.403 for first generation
students in the admissions process, consistent with an overall admission advantage being provided. When examining schools on an individual level, though, different results are seen.

Table 10

<table>
<thead>
<tr>
<th>School (anonymized)</th>
<th>Odds Ratio</th>
<th>Significance</th>
</tr>
</thead>
<tbody>
<tr>
<td>School A</td>
<td>3.543***</td>
<td>.000</td>
</tr>
<tr>
<td>School B</td>
<td>2.604***</td>
<td>.000</td>
</tr>
<tr>
<td>School C</td>
<td>2.414***</td>
<td>.000</td>
</tr>
<tr>
<td>School D</td>
<td>1.732***</td>
<td>.000</td>
</tr>
<tr>
<td>School E</td>
<td>1.716***</td>
<td>.000</td>
</tr>
<tr>
<td>School F</td>
<td>1.646***</td>
<td>.000</td>
</tr>
<tr>
<td>School G</td>
<td>1.445***</td>
<td>.000</td>
</tr>
<tr>
<td>School H</td>
<td>1.351*</td>
<td>.026</td>
</tr>
<tr>
<td>School I</td>
<td>1.091</td>
<td>.665</td>
</tr>
<tr>
<td>School J</td>
<td>1.054</td>
<td>.309</td>
</tr>
<tr>
<td>School K¹</td>
<td>1.032</td>
<td>.852</td>
</tr>
<tr>
<td>School L¹</td>
<td>0.995</td>
<td>.946</td>
</tr>
<tr>
<td>School M</td>
<td>0.628***</td>
<td>.000</td>
</tr>
<tr>
<td>School N¹</td>
<td>0.588***</td>
<td>.000</td>
</tr>
</tbody>
</table>

*** p<.001; ** p<.01; * p<.05 ¹ School has an SAT/ACT-optional admissions policy

The results in table 10 (anonymized and ordered by odds ratio, high to low) show that most of the participating schools have odds ratios greater than 1.0 for first generation college students, suggesting they indeed provided an admissions preference. But several have odds ratios less than 1.0, suggesting that first generation college students are not provided an admissions preference, and are at a disadvantage. Among the ten schools with statistically significant results (p<.05 for all ten, and p<.001 for nine of the ten), eight of the ten showed odds ratios greater than 1.0. Not only were these eight schools’ odds ratios greater than 1.0, seven of these eight were also greater than the overall odds ratio of 1.403. Two schools had statistically significant odds ratios below 1.0, suggesting an admissions disadvantage for first generation college students. The other four schools had results that were not statistically significant.
Considering the second research question with the likelihood of enrollment, overall, the study showed a not statistically significant odds ratio of 1.014 for first generation college students enrolling at their admitted college. Once again, the results at the individual school level tell an interesting story.

Table 11

<table>
<thead>
<tr>
<th>School (anonymized)</th>
<th>Odds Ratio</th>
<th>Significance</th>
</tr>
</thead>
<tbody>
<tr>
<td>School A</td>
<td>0.932</td>
<td>.732</td>
</tr>
<tr>
<td>School B</td>
<td>0.686**</td>
<td>.001</td>
</tr>
<tr>
<td>School C</td>
<td>1.265</td>
<td>.211</td>
</tr>
<tr>
<td>School D</td>
<td>0.434***</td>
<td>.000</td>
</tr>
<tr>
<td>School E</td>
<td>0.702*</td>
<td>.042</td>
</tr>
<tr>
<td>School F</td>
<td>1.519***</td>
<td>.000</td>
</tr>
<tr>
<td>School G</td>
<td>0.927</td>
<td>.628</td>
</tr>
<tr>
<td>School H</td>
<td>0.903</td>
<td>.633</td>
</tr>
<tr>
<td>School I</td>
<td>1.432</td>
<td>.304</td>
</tr>
<tr>
<td>School J</td>
<td>1.125</td>
<td>.242</td>
</tr>
<tr>
<td>School K\textsuperscript{1}</td>
<td>0.661</td>
<td>.237</td>
</tr>
<tr>
<td>School L\textsuperscript{1}</td>
<td>1.154</td>
<td>.219</td>
</tr>
<tr>
<td>School M</td>
<td>1.428*</td>
<td>.027</td>
</tr>
<tr>
<td>School N\textsuperscript{1}</td>
<td>1.218</td>
<td>.401</td>
</tr>
</tbody>
</table>

*** p<.001; ** p<.01; * p<.05; \textsuperscript{1} School has an SAT/ACT-optional admissions policy

The results in table 11 (using the same anonymization as in table 10) show that most of the schools individually have results that are not statistically significant. This is very different than the school-by-school results for admission, where most schools had a statistically significant result at the p<.001. Here, only five schools have statistically significant results, and only two at the p<.001 level. It is worth noting that in this analysis there may be some loss of power, as the number of students with some of the model’s characteristics (e.g. race, first generation) becomes small enough to limit the power of significance tests at some of the colleges with smaller enrolling class sizes.
Summary

This chapter presented the results of the study of the two research questions. Using a logistic regression analysis on a data set of 208,507 students, odds ratios were produced to answer each question. For the first research question, first generation college students had a statistically significant odds ratio greater than 1.0 – 1.403 – showing an admission preference. Eight of the 14 individual schools also had statistically significant odds ratios greater than 1.0, suggesting that the practice of providing an admissions advantage is not uncommon. For the second research question, first generation college students had an odds ratio again greater than 1.0 – 1.014 – showing a slightly greater likelihood for first generation college students to enroll at the schools, but this result was not statistically significant. Further, when examining this question at the individual school level, only five schools had statistically significant results.
Chapter Five: Discussion and Implications

This study examines the question of to what degree two different stages in the College Destination Process influence the enrollment of first generation college students – a proxy for low SES students – in highly selective colleges. The first stage studied is admissions. The analysis of this stage can show if colleges are providing an admission preference to low SES students, also known as class-based affirmative action. The second stage studied is matriculation. The analysis of this stage can show if there are systemic issues with low SES students accepting an admission offer.

For each of the two research questions, statistically significant results were produced following a logistic regression analysis. The study analyzed whether first generation college students are any more likely than other students to be admitted to and to enroll at a set of highly selective universities, holding apart other factors. In addition to examining these questions in the aggregate for the entire set of 14 schools, the study examined results for each of the schools individually.

Results and Discussion: Admissions

Research question 1 asked to what degree, if any, do admissions offices provide an admissions advantage to students from low socioeconomic status backgrounds, holding other factors constant? This study gave an answer of an odds ratio of 1.403 – or, an admissions advantage of 40.3% – holding apart other factors. That is, over the set of 14 schools, if there were two students with equivalent observables except one was first generation college and the other was not, the first generation college student would be 40.3% more likely to be offered admission.
**Relation to previous empirical work.** Several other studies have looked to quantify the admissions advantage or disadvantage for low SES students, with very mixed results (see, for example, Bowen et al. (2005); Espenshade et al. (2009); Griffith and Rothstein (2009)). Among the previous studies, the results of this study are most closely aligned with the results of Espenshade et al. (2009), and conflicts with the findings of Griffith and Rothstein (2009).

Griffith and Rothstein (2009) found that low income students were at an admissions disadvantage: students from the lowest quartile of income were 26% less likely to be admitted to one of 146 Barron’s Most or Highly Competitive schools. Their study, though, had a number of important differences from this study. For one, the researchers included a much broader set of 146 selective colleges, including some public schools not employing holistic admissions and some private schools who explicitly favor affluent applicants. The measured variable, income, is not asked for on the college application and thus is not directly observable by admissions officers, unlike first generation college status or other measures and proxies of socioeconomic status, like the proportion of the student’s high school who attend college. Also, the academic achievement proxy is the ASVAB (Armed Services Vocational Aptitude Battery), which is an aptitude test similar to the SAT and ACT (which, importantly, are observed and used by college admission offices), but no data are presented on how similar or dissimilar the students’ ASVAB and SAT/ACT scores are. Further, the data set – the U.S. Bureau of Labor Statistics’ National Longitudinal Survey of Youth 1997 (NLSY97) – includes only roughly 9,000 Americans born between 1980 and 1984, which represent fewer than 0.1% of all Americans born during those years. As a result, the authors state, the number of students in the sample who even apply to one of the 146 selective colleges is “low” (Griffith & Rothstein, 2009, p. 627).
Unlike Griffith and Rothstein, Bowen et al. (2005) found a positive (though small) advantage for low SES students. In examining first generation college students, the authors found an admissions advantage of 4.1%. While this effect is certainly smaller than the one found in this study, the effect sizes for other variables were also much smaller than found in other studies – for example, a 30.2% preference for recruited athletes compared with a 133% preference found by Espenshade et al. (2009), or a 19.7% preference for legacies, compared with a 213% preference found by Hurwitz (2011). The data set that produced these results included 13 of the 34 selective schools that participated in the Andrew W. Mellon Foundation’s College & Beyond (C&B) database. Some, but fewer than half, of the 14 colleges included in this study are among the 13 in the Bowen et al. dataset. The results may differ because of the different variables included in the respective analyses; both studies included test scores, gender, legacy, and early application, but only the Bowen et al. study included athletic recruits and student income. By separating out the family income effects from the education effect (e.g., first generation college), there may be important differences.

Among the extant empirical studies reviewed in this study, the results from Espenshade et al. (2009) are closest to those in this study. In their analysis of the NCSE data, Espenshade et al. (2009) found a positive admissions advantage for working class students. They quantified that admissions advantage at 42%, which is very similar to the 40.3% found in this study. These similarities exist despite some notable differences. Espenshade et al. (2009) studied a different subset of the C&B dataset, eight colleges referred to as the National Study of College Experience (NCSE). The Espenshade et al. (2009) result may align best because the 34 C&B schools share significant overlap with the colleges in this study, as half of this study’s 14 schools were also included in C&B. The researchers promised the subset of eight NCSE schools anonymity, so it
is not possible to know exactly how much overlap there is between the study populations. One notable difference between the studies is that instead of using first generation college status as a proxy for low SES, the researchers used the responses to a survey question about social class; 85% of respondents considered themselves “middle” or “upper-middle” class; 9% said they were “working class” (Espenshade et al., 2009).

SAT-optional admissions. One interesting observation from the analysis of question 1 for each of the 14 individual schools is that among the schools with the lowest odds ratios for admissions advantage for first generation college students, three of the bottom four were schools with SAT/ACT-optional admissions policies. Because SAT/ACT scores were the proxy variable for academic achievement, students missing scores were excluded from the analysis. And because low-income students more commonly withhold their test scores in applying to test-optional colleges (Belasco, Rosinger, & Hearn, 2014; McLaughlin, 2014; M. Robinson & Monks, 2005), many first generation college students are left out of this analysis. Among the students would opted to not submit tests to the three SAT/ACT-optional schools in this study, first generation college students are overrepresented.

Table 12

<table>
<thead>
<tr>
<th>Students Submitting Scores to SAT/ACT-Optional Schools</th>
</tr>
</thead>
<tbody>
<tr>
<td>Population</td>
</tr>
<tr>
<td>First generation college</td>
</tr>
<tr>
<td>Not first generation college</td>
</tr>
</tbody>
</table>

For the three SAT/ACT-optional schools, only students who submitted scores are included in the analysis, which skews the results. As such, it is difficult to conclude that first generation college applicants at these schools are at a disadvantage overall. One possible interpretation is that first generation college students are given a special preference within the
population of students not submitting scores, since the justification for these policies is generally framed in terms of diversity (Soares, 2015). Previous research suggests that within at least one selective admissions office, it is the case non-submitters are given better ratings, and are more likely to be offered admission, by admissions officers relative to comparable test submitters (M. Robinson & Monks, 2005).

Following the initial analysis, the model was run once again, this time removing the three schools that do not require all applications to submit SAT or ACT scores. Using only the 11 schools that require the exams, the odds ratio for admission rises to 1.534 (significance = .000). In other words, for this set of 11 schools, first generation college students see a 53.4% admissions advantage. This number exceeds the 42% working class advantage found by Espenshade et al. (2009).

Table 13

<table>
<thead>
<tr>
<th>Independent Variable</th>
<th>Odds Ratio</th>
<th>Significance</th>
</tr>
</thead>
<tbody>
<tr>
<td>First generation college</td>
<td>1.534***</td>
<td>.000</td>
</tr>
<tr>
<td>*** p&lt;.001</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Thus, among all schools in the sample for whom the analysis was performed on all domestic applicants (that is, excluding the SAT/ACT-optional schools), the odds ratio for first generation college student admission was greater than 1.0, and in most of these cases were significant at the p<.001 level. In the set of schools in this study, only one school among the 11 that require SAT/ACT testing had results showing first generation college students being disfavored.

**Athletics and other added variables.** Adding other predictive variables to the model would improve the analysis and provide better estimates. One such variable that would improve the model would be recruited athlete status, which provides an admissions advantage at highly
selective colleges (Espenshade et al., 2004; Lucido, 2014). However, only three of the 14 schools provided the consortium with valid data on the admission of recruited athletes. If the full set of schools had good recruited athlete data, it would have made sense to include it in the full model. But since it was only available for three schools, the model was run again (only for the three colleges with the appropriate data), adding recruited athlete as an additional independent variable, categorical and dichotomous, with a 1 representing “yes” and a 0 representing “no.”

Table 14

<table>
<thead>
<tr>
<th>School (anonymized)</th>
<th>Odds Ratio (w/o Athletes)</th>
<th>Significance</th>
<th>Odds Ratio (w/Athletes)</th>
<th>Significance</th>
</tr>
</thead>
<tbody>
<tr>
<td>School D</td>
<td>1.732***</td>
<td>.000</td>
<td>2.133***</td>
<td>.000</td>
</tr>
<tr>
<td>School I</td>
<td>1.091</td>
<td>.665</td>
<td>1.223</td>
<td>.323</td>
</tr>
<tr>
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<td>.343</td>
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</table>

\(^{***} p<.001; ** p<.01; * p<.05\) School has an SAT/ACT-optional admissions policy

For all three colleges, including recruited athlete admission in the model improved the odds ratio for admission of first generation college students. Only one of the results was significant (for both the original and revised model), with the odds ratio increasing from 1.732 to 2.133. For the other two colleges, the results were not significant, though including the new factor in the model improved the significance. For both colleges, the odds ratio increased, and for College L, first generation college students went from an observed admissions disadvantage to an admissions advantage.

This is an important addition to the model because in addition to providing an admissions advantage, recruited athletes at highly selective schools are more likely to come from advantaged backgrounds and make up a substantial proportion of the student body. For example, at Amherst College, only 4% of male varsity athletes and 2% of female varsity athletes were first generation college students in the 2011-2015 student cohorts, while 20% of non-athletes were first
generation college (Special Committee on the Place of Athletics at Amherst, 2016). These athletes comprised between 27% and 33% of the entering class at Amherst each year between 2010 and 2016 (Special Committee on the Place of Athletics at Amherst, 2016).

Admissions disadvantage and the applicant pool. Overall, first generation college students comprised 18% of the records in the dataset. Interestingly, the two schools with a statistically significant admissions disadvantage, Schools M and N, had the lowest and highest proportions of first generation college students in their respective applicant pools (12% and 32%, respectively). These facts suggest possible explanations for the admissions disadvantage.

For School M, with its 0.628 odds ratio showing a significant admissions disadvantage, an applicant pool proportion of first generation college students at roughly two-thirds of the average of the group may not be a coincidence. It may be that low SES students are responding rationally to signals being sent by School M through its admissions decisions. If low SES students are disadvantaged in the admissions process, and it is in some way visible or apparent to students, it may discourage low SES students from applying, or conversely encourage even more applications from students who are not low SES.

For School N, its odds ratio of 0.588 is at least in part explained by its SAT/ACT-optional policy, as described above. It could also be that because first generation college students are so numerous in their application pool – nearly twice the average of the dataset – that the admissions process has adapted to this outlier proportion. One explanation could be that the college, in seeking various kinds of diversity, needs to advantage students who happen to not be first generation college as it seeks to round out its class. Another explanation could be the converse of an above theory for School M – that low SES students are responding rationally to signals being sent by School N through its admissions decisions. In this case, if students
perceive that the campus environment (e.g., financial aid, cost, presence of classist organizations) at School N is particularly friendly for low SES students, it would encourage many applications from low SES applicants, perhaps even some who are less qualified than who would apply to the average selective school. This same environment could discourage applications from high SES students who seek an environment that amplifies their relative privilege.

**Outreach programs.** Even if there is an admissions advantage provided to first generation college students, there still will be few students admitted in raw numbers if the number of applicants is small. Previous research suggests that the application stage is a critical stage at which many low SES students are lost from the college enrollment pipeline (Belasco & Trivette, 2015; Dillon & Smith, 2013; Hoxby & Avery, 2012; Smith et al., 2013).

To help address this problem, colleges have formed partnerships with organizations that work with and support low SES students. The partnerships that colleges have established with QuestBridge and Posse may help to explain the results seen in this study. Among the five colleges in this study with the largest odds ratios for admission of first generation college students, all are partners with QuestBridge, but only one of the bottom five colleges is a partner. However, three of the bottom five schools are Posse partners, while only one of the top five is a partner.

The programs have different structures. With QuestBridge, large numbers of students are named “finalists” who then can apply to the currently 38 highly selective colleges that are QuestBridge partners. In 2015, 4,895 students were named finalists (and thus were applicants to at least a subset of the partner colleges), and 2,257 were admitted to at least one partner college (QuestBridge, 2017). In 2016, 70% of finalists were first generation college students, 76% were
eligible for free or reduced price lunch, and the median income was $35,005 (QuestBridge, 2017).

Posse works differently. Schools admit their “posse” directly and all at once. A typical posse is ten students who enroll together; only these ten students would be considered applicants. Posse students are slightly higher SES than QuestBridge finalists, on average, as 61% of Posse students are first generation college and 30% consider themselves “middle” or “upper middle” class (Posse Foundation, 2012, p. 5).

These structures suggest different possible impacts on this study’s results. One possibility is that because the number of QuestBridge admits is large compared to the size of a school’s posse, the admissions preference is more visible in the analysis for QuestBridge partners than for non-QuestBridge Posse partners (and, as an extension, non-QuestBridge, non-Posse partners). It also could be that QuestBridge partners institutionally practice class-based affirmative action to a greater degree. Another possibility is that QuestBridge might be more efficient at enrolling first generation college students, perhaps because of the lower SES profile of its participating students. Overall, it is not clear what, if any, effect partnership with one of these organizations has in enrolling low SES students.

**Trends.** This study examines a snapshot in time by analyzing just one admissions cycle. As previously mentioned, this study’s results align with those of Espenshade et al. It is worth noting that this study’s data comes from 2015, while the Espenshade et al data come the fall of 1997. Given the increased scrutiny from Washington, the media, and scholars, one might expect that the degree of preference for low SES students would not be level since 1997, but instead would have risen in the nearly two decades in between.
Data from Chetty et al. (2017) show how enrollment at highly selective colleges has changed over the decade-plus from 2000 to 2011. Over this period, Chetty et al. (2017) find that for a group of 12 schools they call “Ivy-Plus” (the eight Ivy League schools plus Chicago, Duke, MIT, and Stanford), the proportion of students from the lowest quintile of American incomes rose slightly, 0.65 percentage points, but remained low – fewer than 5% of enrolled students. The researchers also looked at the rest of the schools classified as “Most Competitive” by Barron’s, calling them “other elite.” For this group over the same time period, the percentage of bottom quintile students fell 0.46 points, with the total proportion of bottom quintile students remaining under 5%.

**Results and Discussion: Matriculation**

Research question 2 asked to what degree, if any, does being a student from a low socioeconomic status background impact matriculation at a highly selective college, holding other factors constant? This study gave an answer of an odds ratio of 1.014 – an increased likelihood of enrollment of 1.4% – holding apart other factors from this study, though the result was not statistically significant.

**Relation to previous empirical work.** Unlike for research question 1, the individual college analysis for research question 2 did not show many statistically significant results. In research question 1, 10 of the 14 schools had statistically significant results: p<.05 for all 10, and p<.001 for nine of the 10. Further, of the significant results, eight of the 10 were in the same (positive) direction. However, for research question 2, only five schools had results of any statistical significance, and only two reached the same p<.001 significance that nine schools reached in research question 1. Also, two of the five pointed in a positive direction, while the
other three pointed in the other, negative direction. Overall, the model for this research question does not seem as robust, and it is likely that important predictors are missing.

Among the missing factors that could be relevant are those related to college cost. Because these schools have significant financial resources, it is likely that many first generation college students will receive a great deal of financial aid. Similarly, for more affluent students who may not receive aid, the tuition costs are high. If financial aid and cost variables were added, the results might be better. Financial aid and costs are to be important for many students in deciding which admissions offer to accept, but is more important for low SES students (Radford, 2013). Other important factors not included here are distance from home (Hoxby & Avery, 2012) and relative quality/prestige of the academic programs and colleges in the choice set (Radford, 2009).

**Individual colleges.** While fewer individual school results are significant in research question 2 compared with research question 1, the trend that can be seen overall is somewhat opposite to what was seen in the analysis of admissions advantage. That is to say, the majority of schools which provided a statistically significant admissions advantage have matriculation odds ratios less than 1, while the majority of the schools that did not provide a significant admissions advantage have a matriculation odds ratio greater than 1. The reason for this cannot be known from this analysis, but there are at least several possibilities suggested by previous research.

Because financial aid and net cost are especially important to low SES students, and because there are no cost or aid variables present in the model, it could be that important differences in first generation student behavior are not being observed. Similarly, the school’s distance from the student’s home is not a variable in the model, despite its importance; it could
be that those schools with lower enrollment likelihood have a more national and less local group of admitted students. The research also says that the quality or prestige of the college and of the college’s academic program in the student’s intended major are important, but there are no variables in the model to capture these factors.

It may also be that for individual schools, the admissions advantage and enrollment likelihood are linked. For example, if a school knows its first generation college students are less likely to matriculate, it may be more likely to admit such students to reach its enrollment goals; conversely, if a school knows its first generation college students are more likely to matriculate, it may be less likely to feel a need to affirmatively admit such students. Because of the important missing variables and less statistically significant results, though, it may not be wise to draw too many conclusions about the matriculation likelihood results for the individual colleges without further, better analysis.

The model shows odds of matriculation for first generation college students, relative to their complementary group – non-first generation college students. It also may be the case that the individual college results seen don’t have as much to do with factors important to first generation college (FGC) students, but have more to do with the higher SES non-FGC students. If for some reason, such as perception of campus climate, non-FGC students are particularly attracted to a certain campus, the relative odds of first generation college student matriculation would be lower.

**Outreach programs and individual college matriculation.** Again, partnerships with outreach organizations could play a role. With QuestBridge, some students are admitted to some schools through a binding process similar to early decision, called a binding match, but many more students – greater than 70% of more than 2200 students – are admitted through non-
binding processes (QuestBridge, 2017). And because QuestBridge students can apply to any of
the 38 partner schools without an application fee, many of these students find themselves
applying to and being admitted to multiple highly selective colleges. This may depress the odds
for matriculating at any one QuestBridge school for these students with options. In fact, of the
seven schools with matriculation odds ratios less than 1, all are QuestBridge partners.

**Implications for Practice**

Given the increasing level of interest in this topic from universities, policymakers,
researchers, the media, and beyond, this project’s results have implications for practice and
policy. The results can inform practice for universities seeking to increase their socioeconomic
diversity. It also can shape policy discussion around the problem of college enrollment of low
income students.

**For colleges.** For the growing number of colleges interested in low SES student
enrollment, schools should examine and analyze their own practices in terms of holistic
admissions preferences. Universities can conduct similar analyses to the analyses in this study,
using as many factors in the model as possible. Individual schools will have access to more
factors than were available in this study. For a model analyzing admissions advantage, additional
factors might include standardized grade point average, class rank, teacher recommendation
ratings, ratings assigned by admissions staff readers, and more. Following such an analysis,
schools should compare their results with their institutional mission and enrollment goals.
Depending on the results, colleges may want to make appropriate adjustments to their practices,
such as modifying their admissions reader training and guidelines around admissions
preferences.
Schools can also conduct an analysis for matriculation likelihood, as in this study’s research question 2. Such a model could include additional factors like distance to campus, net price, loan expectation, intended major, campus visits, and more. If after such an analysis the likelihood is still less than 1 for first generation college students, schools may want to look at less quantifiable aspects of campus climate that could be unattractive for these students.

For colleges that are already practicing class-based affirmative action and still want to increase the proportion of low SES students in their enrolled student populations, other, earlier steps in the College Destination Process could provide a guide. At the predisposition phase, more outreach work could be done to make highly selective colleges be considered as a financial reality. The perceived high tuition costs may make low income families predisposed to discard these colleges as options, despite net prices that often are lower than in-state public options.

At the preparation phase, colleges can utilize pre-college pipeline programs. A number of colleges, including highly selective colleges, have academic programs for high school students who have less access to advanced coursework, test preparation, and college counseling. By starting new programs, or expanding existing programs, more low SES students can have access to the credentials and college knowledge than high SES students have.

At the exploration phase, colleges might focus recruitment efforts to a greater degree on low SES students. Because low SES students have less financial capital to travel to distant college campuses for a visit, colleges can implement or expand “fly-in programs,” where well qualified low SES students are provided with a free campus visit, travel and incidentals included. Hoxby and Turner (2013b) have also shown that the right targeted, information-rich mailings to low SES prospective students can be effective.
In the application stage, colleges can take steps to reduce application barriers for low SES students. Proactively sending students application fee waivers, or otherwise making the application fee less of an issue, could help. Deep partnerships with national organizations like QuestBridge and Posse may also help increase the number of qualified low SES students in the application pool.

For policy. Policymakers and advocates for low SES students can use this study to confirm that for many highly selective schools, class-based affirmative action already exists. Instead of arguing that schools should practice class-based affirmative action, they can change their focus to other policy recommendations that can be implemented for positive change. For example, further work in encouraging applications from low SES students, or lowering their barriers to apply, may be quite effective. Similarly, work increasing access at other early stages of the College Destination Process, like predisposition, exploration, or especially preparation may be very important work.

Discussion of class-based affirmative action need not be completely put aside, though the focus of those conversations perhaps should change. The level of first generation college admissions preference in this study, while similar to those of Espenshade et al. (2009), is less than other preferences examined in the same study. For example, athletes were seen to receive an admissions advantage with an odds ratio of 2.33, and students who attended one to the 72 most elite feeder high schools received an advantage of 3.09 (Espenshade et al., 2009). Three schools in this study are providing an admission preference similar or greater in magnitude compared with what Espenshade et al. (2009) observed for athletes. If these three schools are providing a preference to this degree, others might be able to similarly increase their degree of preference for
first generation college students. Policymakers and policy analysts could push colleges to increase the degree of class-based affirmative action being practiced.

**Implications for Future Research**

The question of what has caused a relatively small enrollment of low socioeconomic status students in highly selective colleges is complex. Recall that the College Destination Process framework has six distinct stages, each of which can impact the enrollment of low SES students. This study examined two of the six stages on which colleges themselves have the greatest control, admissions and matriculation. This study shows a statistically significant positive correlation for first generation college students in the admissions stage, but no conclusive results at the matriculation stage. Highly selective colleges are providing an admissions advantage to first generation college students, though it is unclear if these students are any more likely to enroll at the colleges once admitted. To truly get to the heart of the question of why relatively few low SES students enroll in selective colleges, all six stages of the College Destination Process should be examined. Because the previous stages have relationships to the stages being examined in this study, these stages also should be the subject of further analysis. For example, looking at predisposition and exploration more deeply may help to produce better results for the question of the influence of the matriculation stage on the College Destination Process. Quantitative correlational studies of the framework could help to illuminate the interactive relationship between the various stages.

In this study’s first research question, the behavior of admissions offices at highly selective schools is quantified. Qualitative research looking at the differences in training, mission, and process for schools giving different degrees of preference would complement this and other quantitative research well. What are the characteristics of schools that provide a
significant admissions advantage for low SES students? How does that compare with those that do not provide a significant advantage, or those that put low SES students at a significant disadvantage? A cross-case analysis involving some of schools with notable results, such as Schools A, B, M, and/or N, would be very insightful.

The practice of class-based affirmative action can be better understood through studies of the admissions officers who implement it. What markers or proxies of class, SES, and disadvantage are used? Which are operationalized as targets for class-based affirmative action? Previous empirical works discussed earlier in this paper use a variety of markers: parent education (including first generation college students), family income, family wealth, student self-reports of class, neighborhood context, school context, and more. Better understanding of the practice of class-based affirmative action can lead to better studies of it, such as which variables should be most closely examined.

With many highly selective colleges now partnering with national non-profit outreach programs, and these programs accounting for a significant proportion of socioeconomic diversity on some campuses, further study of these programs would be helpful in understanding the pathways for low SES students to college. To what degree, if any, does participating in a program like QuestBridge or Posse give a student a college admission benefit, compared to similar low SES students who apply through traditional means? Quantitative studies of these programs could provide such insight.

With the existence of class-based affirmative action being confirmed by this study, attention may turn to increasing applications from low SES students. One tactic universities might employ is further partnership with organizations like QuestBridge and Posse. Future studies should examine these programs to better understand the pathways within. To what degree
do each of these programs help low SES students access college? To what degree do they help colleges enroll a more socioeconomically diverse class?

With the mixed results for the second research question, further quantitative research on the matriculation stage is warranted. Future research should utilize a data set including variables like distance, aid, and cost. When all important factors are included in a model and held apart from other factors, are first generation college students still more likely to enroll in a highly selective college, as this study’s results suggest? To further understand the impact of the matriculation stage, such a data set would ideally include information on all students’ college destination. Is it a selective school? Is it an academic “match” for the student? And if the choice set of options (the schools to which the student was admitted) were included, along with the net prices and other institutional characteristics, student decision making could be better understood, and analysis by SES.

**Limitations**

This study included only 14 colleges, all highly selective. Not all selective schools, or even all Most Competitive schools, are represented here. One cannot necessarily extrapolate the results of this study out to all schools. The alignment of the admissions advantage results of this study with that of Espenshade et al. (2009) suggest that a relatively broad set of highly selective colleges are employing class-based affirmative action, even if it is not possible to say that all or most are.

This study only examined two of the six stages of the College Destination Process. The first four stages, predisposition, preparation, exploration, and application are either not directly examined or only addressed via proxy (for example, test scores as a proxy for the level of
preparation). The earlier stages influence the later stages that are analyzed in this study, but the effects of each of these stages cannot be analyzed directly.

This admissions advantage for first generation college students found in this study is unlikely to fully capture any advantage provided to low SES students. First generation college student status is an imperfect proxy for low socioeconomic status. For example, in its financial aid initiative, Harvard “initiated a systematic procedure for identifying disadvantaged students” (Avery et al., 2006, p. 6), and in its socioeconomic diversity initiative, Amherst College “adopted a more sophisticated definition of [merit] by incorporating additional measures” relating to a student’s background (Rubin, 2011, p. 522). These colleges’ measures of disadvantage are not enumerated, but in recent years methods of quantifying success in context have become much more sophisticated than the simple use of one data point like first generation college student status (Gaertner & Hart, 2013). Similarly, for schools putting first generation college students at a disadvantage, first generation college student status may be a proxy for other factors often considered in admissions decisions that are not captured in this study’s model, like demonstrated interest in the college (that is, signals to a school that a student is likely to accept an admission offer, if made) or extracurricular leadership.

Further, the quantified result of the admissions advantage for first generation college students is less than precise due to the many important but unobserved factors not captured in this model. Some of these factors not in the model include grades, essays, and recommendation letters (Clinedinst et al., 2015). Other factors include maximizing opportunities for challenging coursework in the curriculum, extracurricular activities and leadership, and so-called demonstrated interest (Bastedo, 2016). And, as previously noted for the relative odds of
matriculation, many important factors are similarly not captured in the model for the second research question, like financial aid and distance from home.

Conclusion

This study sought to understand the problem of relatively small enrollment numbers of low SES students at highly selective universities. The College Destination Process, in which possible college students become matriculated college students, has six distinct stages, each of which plays an important role in getting students to enroll. This study took a quantitative look at two crucial stages of the College Destination process, admissions and matriculation, to better understand the role that admissions officers and admitted students play in the research questions.

The results suggest that low SES student enrollment probabilities are not diminished in either of these two stages (and are increased in the earlier of the two, admission). In the end, though, low SES students are underrepresented in the student bodies of highly selective colleges. This suggests that the stage(s) most responsible for the low enrollment of low SES students are among the previous four stages: predisposition, preparation, exploration, and application.

Even so, improvements along any of the six stages of the process would increase low SES student enrollment. While no negative effects are seen overall in the admissions and matriculation stages, there does not appear to be any reason why the effects could not be even more positive. Indeed, studies have shown that the effects are greater for other student traits. Colleges looking to increase low SES student enrollment should look to any stage of the College Destination Process on which they believe they can have a significant impact. Relatedly, policymakers seeking to improve low SES enrollment should consider interventions at all stages of the College Destination Process, rather than only focusing on effects at the admissions stage (such as class-based affirmative action) or the matriculation stage (such as financial aid from
endowments). By taking a big picture view across the entire six-stage process, progress can be made on the enrollment of low SES students.
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Appendix A

Research Question 1 Model Performance and Model Usefulness

Table A1

*Omnibus Tests of Model Coefficients*

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Table A2

*Model Summary*

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₉ a. Estimation terminated at iteration number 6 because parameter estimates changed by less than .001.
Appendix B

Research Question 2 Model Performance and Model Usefulness

Table B1

*Omnibus Tests of Model Coefficients*

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Table B2

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\(^a\) Estimation terminated at iteration number 5 because parameter estimates changed by less than .001.